WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

EROSION CONTROL DESIGNERS COURSE

Prepared for

WSDOT

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1 INTRODUCTION

1.1 Purpose

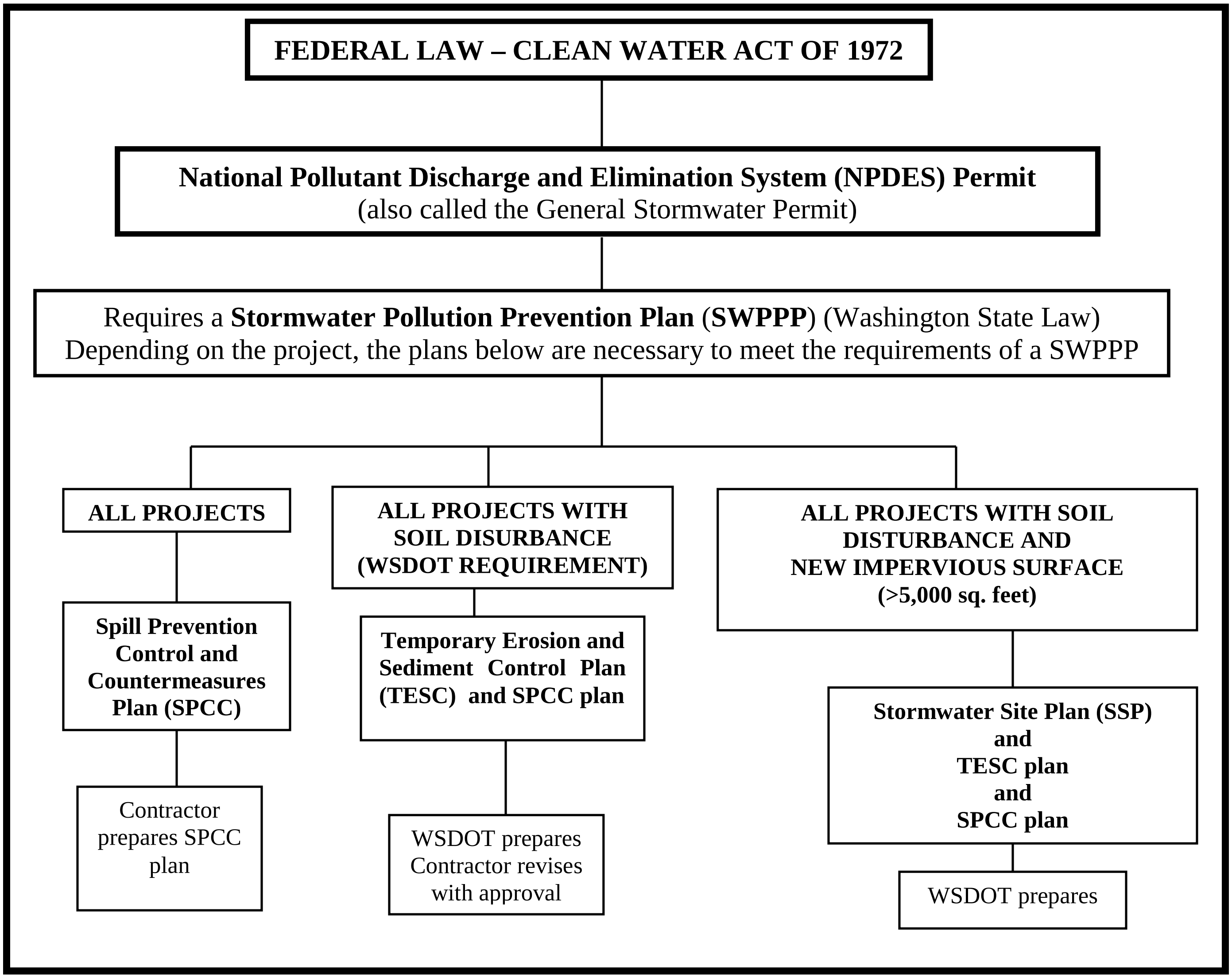
Washington State Department of Transportation (WSDOT) requires Erosion and Sedimentation Control (TESC) plans on all construction projects involving earthwork. Earthwork includes excavation, clearing, grubbing, trenching, or any activity that exposes bare soil to precipitation or wind. An effective erosion control plan saves both time and money, and thus allows WSDOT to fulfill its responsibility to build highways in both fiscally and environmentally responsible manners. This TESC Plan design workbook was created to give WSDOT design engineers the tools to develop more effective erosion control plans.

TESC plans are a requirement on all WSDOT projects involving earthwork. The erosion plan may or may not be part of a Stormwater Site Plan (SSP) depending on the project condition as shown in Figure 1.

This TESC plan training course is designed to provide the following:

- TESC plan requirements and why TESC planning is important
- Directions for collecting data on site conditions
- Resources for assessing the risk for erosion
- Evaluating site data and selecting best management practices
- A template to facilitate and standardize erosion control plan preparation.
- Scoping and budgeting tools for TESC planning
- Contract preparation guidance for implementing TESC Plans

FIGURE 1.1: PLAN REQUIREMENTS



1.2 TESC Plan Requirements

A standard WSDOT TESC plan includes a narrative section, a set of site plans, and descriptions for meeting the 13 minimum requirements as described in the WSDOT Highway Runoff Manual. The 13 minimum requirements include the following:

- **Minimum Requirement #1: Stabilization and sediment trapping.** Exposed and unworked soils are stabilized and runoff leaving the site passes through an appropriate best management practice (BMP).

- **Minimum Requirement #2: Delineate clearing and easement limits.** Setbacks, drainage courses, easements, and sensitive or critical areas are identified, and the existing vegetation is preserved where possible.

- **Minimum Requirement #3: Protection of adjacent properties.** BMPs are implemented to prevent degradation of adjacent properties due to erosion or sedimentation.

- **Minimum Requirement #4: Timing and stabilization of sediment trapping measures.** BMPs designed to trap sediment on-site are in place and functional before land disturbing activities begin.

- **Minimum Requirement #5: Cut and fill slopes.** Design and construction of cut and fill slopes to minimize erosion.

- **Minimum Requirement #6: Controlling off-site erosion.** The volume, velocity, and peak flow rates from construction site runoff are controlled to protect properties, water bodies, and other environmentally sensitive areas located downstream from the site.

- **Minimum Requirement #7: Stabilization of temporary conveyance channels and outlets.** The outlets of conveyance systems and adjacent stream banks are protected.

- **Minimum Requirement #8: Storm drain protection.** On-site sediment is prevented from entering storm sewer inlets.

- **Minimum Requirement #9: Underground utility construction.** A Puget Sound condition that requires no more than 500-feet of trench open at any one time; excavated material placed on the upslope side of the trench where possible; and trench dewatering devices discharge to sediment traps or sediment ponds.

- **Minimum Requirement #10: Construction access routes.** The transport of mud and sediment onto paved surfaces is minimized.

- **Minimum Requirement #11: Removal of temporary BMPs.** Temporary erosion and sediment control BMPs are removed within 30-days of final site stabilization; trapped sediment is stabilized onsite; and disturbed soils resulting from the removal of BMPs are permanently stabilized.

- **Minimum Requirement #12: Dewatering construction sites.** A Puget Sound condition that requires that dewatering devices discharge into a sediment trap or sediment pond.

- **Minimum Requirement #13: Maintenance.** An inspection schedule and maintenance plan for temporary BMPs is provided.

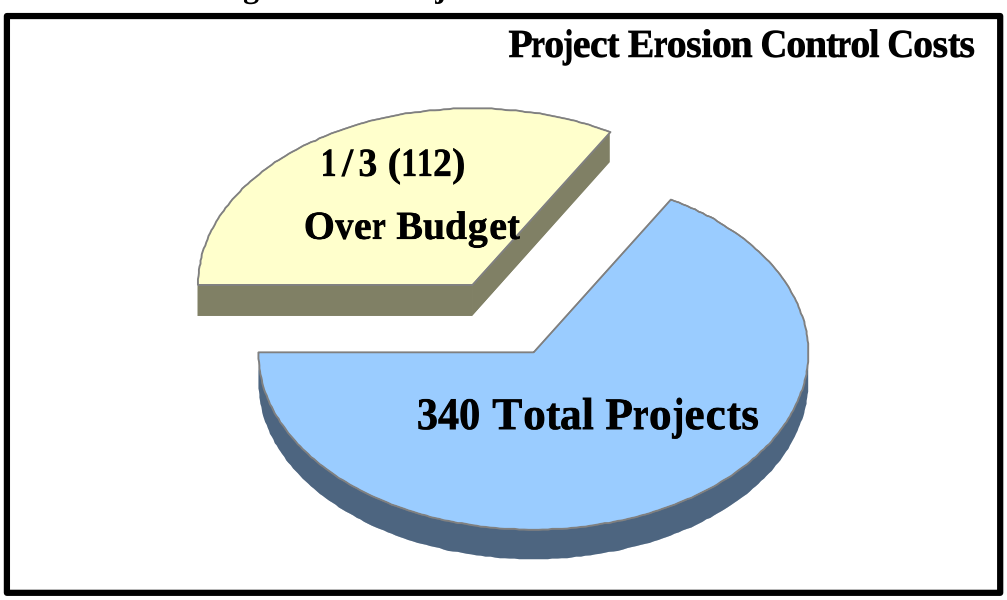
All minimum requirements must be considered during the planning process. Not all requirements are applicable on every project. When a requirement is not applicable, a simple statement should be included in the TESC plan indicating why that requirement is not applicable.

The purpose of TESC planning is to clearly establish when, where, and how specific BMPs will be implemented to prevent erosion and the transport of sediment from a site during construction. TESC planning is used to identify potential problems and to provide solutions to eliminate or minimize the risk of erosion. The TESC plan should indicate what BMPs will be implemented in the design of the project as well as the procedures used during construction to minimize erosion. Due to the unpredictable nature of weather and construction conditions, an erosion control plan must be a living document that is open to modifications or additions during construction.

1.3 Current Performance of Plans

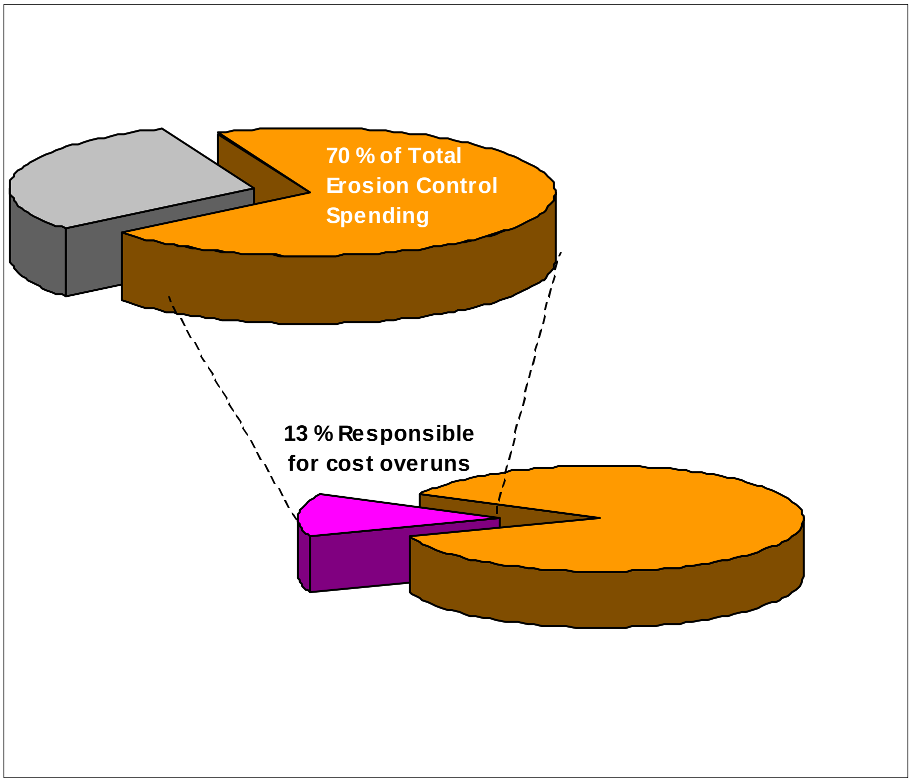
In 2000, WSDOT performed a study to assess the costs of erosion control in the field. The study included a review of approximately 340 projects (minimum size $1,000,000 each) that were completed between 1995 and 1999.

Figure 1.2 – Project Erosion Control Costs



On average, erosion control costs during project construction have exceeded estimated amounts by about 50 percent as identified under the line item Water Pollution Prevention/Erosion Control. Erosion control costs on approximately one-third of the projects were over budget. Only 45 of the projects, however, were responsible for the majority of the cost overruns. The 45 projects were budgeted at $1.7 million for water pollution prevention/erosion control, but a total of $5.5 million was spent. Those 13 percent of projects were responsible for 70 percent of total erosion control spending!

Figure 1.3 – Erosion Control Cost Overruns



There were many contributing factors to the cost overruns. If the contributing factors are identified in the design process, adequate plans can be prepared so that resources can be dedicated to preventing severe erosion-related costs.

There was a strong correlation between the projects with large cost overruns and environmental violations/fines. Effective TESC planning and implementation can be used to avoid cost overruns and concurrently eliminate most water quality violations

1.3.1 Problem Identification

What went wrong? A survey was conducted that asked that question to the construction Project Engineers. Factors contributing to the cost overruns that were identified by the engineers included:

- There was no contractual means to limit the extent and duration of soil exposure in the wet season.

- Offsite drainage was calculated incorrectly or missed altogether.

- Substantial portions of the project were not included in the plans.

- High water tables saturated the site.

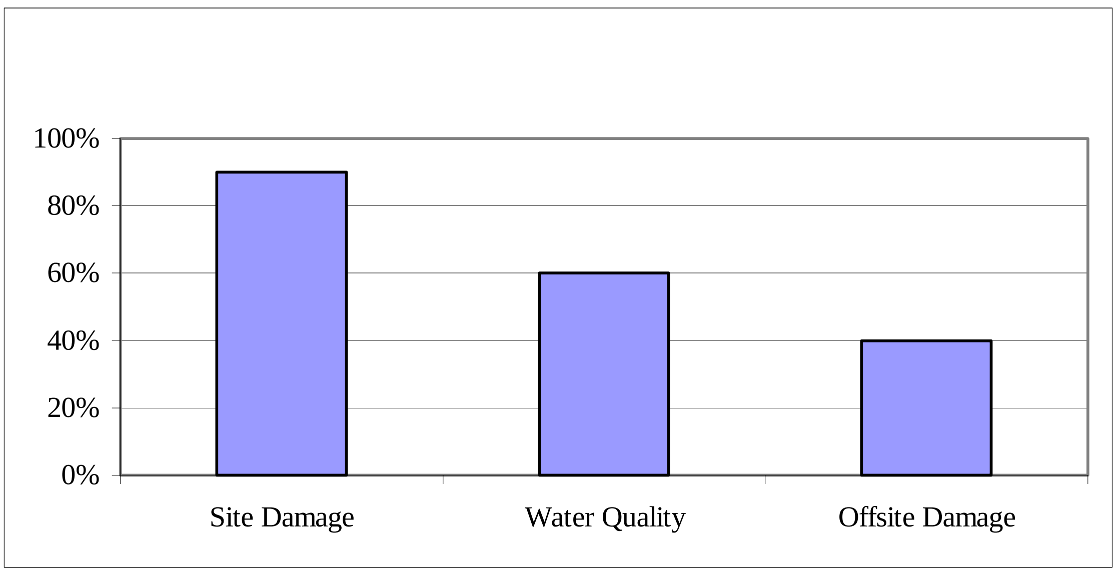
- Erosion occurred on cut and fill slopes.

- Construction lasted longer than anticipated, causing soil to be exposed for greater duration than anticipated.

- The plan did not account for unusually wet weather with extreme rainstorms.

The biggest issues for the projects were site damage (90 percent), water quality problems (60 percent), and offsite damage (40 percent). Most sites exhibited a combination of all three problems.

Figure 1.4 — Erosion and Sediment Control Problems



The greatest problems usually occurred when more than 2 acres of soil were exposed between November and May. When more than 5 acres of soil were exposed during the wet season there were almost always problems. The location of the exposed soils (i.e., proximity to streams or wetlands) was sometimes more important than the total area.

Infrequent summer storms caused severe erosion damage on a few sites. Problems occurred on sites with all soil types, but were found predominantly on sites with silt and clay. Offsite drainage and seasonal groundwater fluctuations also contributed to cost overruns. One project required approximately $1 million in drainage improvements that were not covered by the plans.

Regulatory agencies such as the Washington State Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), and county and city permit inspectors became involved at approximately 80 percent of the sites with large erosion control cost overruns. Ecology issued Notices of Correction requiring WSDOT to implement extra measures on half of these sites and fines were levied at 30 percent of them. In general the Project Engineers described regulatory agencies as cooperative and understanding with WSDOT staff. Nevertheless, on 20 to 30 percent of the sites, the required corrective actions added to project costs and led to significant delays.

Project Engineers stated that contractors were generally cooperative on the problematic sites. Although some of the contractors may have been slow to understand the importance of erosion control, they all made serious efforts to solve erosion problems when the work was seriously hampered.

1.3.2 Problem Prevention

Project Engineers were asked what would have prevented problems on their sites. Their suggestions can be organized into 3 groups: 1) create adequate erosion plans; 2) provide adequate funds; and 3) provide contractual tools for plan implementation.

1) Recommendations for TESC planning included the following:

- Make plans site specific, including all sources of runoff, seeps, and groundwater
- Include intermediate project stages in the planning process
- Provide for covering cut slopes as they are exposed

2) Survey respondents indicated that for roughly 75 percent of the projects the budgeted amount for water pollution prevention/erosion control was not realistic, even <u>for normal conditions</u>.

3) Suggested GSPs or special provisions include:

- Limiting earthwork in the wet season. This was the change that was most commonly identified by Project Engineers as the most important contractual means to control erosion.
- Stabilizing soils by installing ground cover as the slope is exposed rather than at the end of the project

- Controlling offsite runoff through the project site
- Timing and execution of contracts. Ponds should be installed as the first step in grading, etc.

The project engineers also recommended that designers visit project sites prior to creating plans and during significant rainfall events to evaluate the effectiveness of the erosion control BMPs they prescribed.

1.3.3 Improving TESC Plan Performance

Effective TESC plans are the responsibility of all WSDOT project personnel. The first step to enhancing plan effectiveness is improving planning. This manual is designed to provide designers with guidance to help identify and evaluate potential erosion and sedimentation problems, determine specific BMPs to control erosion and sedimentation, and design effective solutions.

2 DATA COLLECTION

2.1 Introduction

To create an effective TESC plan, site-specific data must be collected regarding soil type and texture, weather, topography, drainage patterns, groundwater, and sensitive areas on or near the site. The risks associated with each factor must be evaluated and accurately assessed.

Risk assessment for erosion must be considered at both the individual project level, and at the agency level. Risks associated with environmental violations must be viewed on a cumulative basis for the agency because regulators view WSDOT as one entity. If each office is comfortable with a 10 percent probability of erosion problems, some individual offices may go for years without problems. That same level of risk for WSDOT on an agency wide basis produces 10 problems a year if we work on 100 projects per year. Such problem projects get all of the publicity and have a huge impact on WSDOT's reputation, with regulators, the public and lawmakers.

2.2 Project Risk Assessment Guidelines

Addressing the potential risks of erosion and sedimentation impacts on a construction project is key in preventing increased construction costs resulting from stop work orders, regulatory fines, and construction delays. Many factors influence the amount of inherent risk on each project. These factors will be described below, along with tools to determine whether the risk is low, medium, or high. A Site Erosion Risk Checklist is provided in Section 2.5 that can be used to help create the erosion control plan for the project. Using the checklist will help the designer obtain a better understanding of the potential erosion/sediment control risks before construction begins and minimize those risks through project design and an effective TESC plan.

2.3 Risk Assessment Evaluation Tools

The following sections detail the factors that affect risk on a site and present a description of the tools used to evaluate the inherent risk associated with each factor. Risk factors include:

- Soil texture
- Weather
- Topography
- Flowing water
- Groundwater
- Sensitive areas

2.3.1 Soil Texture

Soil texture is determined by the proportion of sand, silt, and clay particles in the soil. Soil texture affects the erodibility of the soil, how quickly soil particles will settle out of runoff, and the amount of runoff that will occur at a site. Intermediate-sized soil particles such as silts and fine sands are the most easily eroded. Coarse sands are moderately erodible and clay particles are the least erodible. Soils having more than 30 percent silt tend to liquefy when saturated and have the greatest risk for mudslides.

Soil texture influences the turbidity of construction runoff. The finer the soil texture, the more turbid the runoff and the more persistent the turbidity. The rate at which eroded soil particles settle out of solution as sediment is largely determined by the size of the particle. Larger particles like sand weigh more and settle faster, whereas, smaller particles like silt and clay weigh less and settle more slowly. Some soils containing extremely small particles promote colloidal suspensions that do not settle out of suspension for years. Settling rates for a wide range of soil particle sizes are indicated on Table 2.1.

Soil texture influences runoff volumes and infiltration potential. Water percolates more rapidly into coarse textured, highly porous soils. Some course-textured soils are so porous that all rainwater spontaneously infiltrates. Fine textured silt and clay soils permit almost no infiltration and generate large runoff volumes. Fine textured soils also take longer to dry between storm events and may remain unworkable for long periods of time.

Table 2.1

Settling Velocities Of Soil Particles In Still Water

Diameter of Particle (mm)	Order of Size	Settling Velocity (mm/sec)	Time Required to Settle One Meter (3.28 Ft)
10.0	Gravel	1.000	1.0 Seconds
1.0		100	9.8 Seconds
0.6	Coarse Sand	63	15 Seconds
0.3		32	30 seconds
0.15	Fine Sand	15	67.0 Seconds
0.015		0.35	47.6 Minutes
0.010	Silt	0.154	107.0 Minutes
0.003		0.0138	20.1 Hours
0.0015	Clay	0.0035	79 Hours
0.001		0.00154	180.0 Hours
0.0001		0.0000154	754.0 Days
0.00001	Colloidal Particles	0.000000154	207.0 Years
NOTE: Temperature 50°C; all particles assumed to have a specific gravity of 2.65.			

2.3.1.1 Soil Assessment Tools

There are several ways to determine the potential for erosion and sedimentation problems associated with the soils. These include geotechnical reports, county soil surveys, jar testing, and hand texturing. Jar testing and hand texturing are described in detail in the Construction Site Erosion and Sediment Control Certification Course manual. An overview of geotechnical reports and soil surveys is presented below.

2.3.1.1.1 Geotechnical Reports

Materials engineers prepare geotechnical reports, which include the structural properties of soils for construction purposes. These reports include information on soil erodibility, infiltration rates, groundwater levels and often provide specific recommendations to prevent erosion, such as stating maximum allowable slope angles or stating when retaining walls are required. Geotechnical reports are prepared by the Olympia Service Center Materials Laboratory (OSC). The regional materials engineer should be used as a resource when assessing a site for potential slide or high groundwater areas, as well as potential infiltration areas.

2.3.1.1.2 Soil Surveys

The Natural Resource Conservation Service (NRCS), formerly the Soil Conservation Service, has performed soil surveys throughout the State of Washington and has developed maps that show specific soil classifications for any given location. Soil maps are compiled by county and are typically available from the regional NRCS office. The NRCS soil surveys contain valuable information that can be readily applied when creating erosion and sediment control plans. One type of information provided in the soil surveys is hydrologic soil groups (see below). Project engineers should note that soil surveys are performed on very large scales and may not reflect the exact site characteristics.

County soil surveys are free and available at regional NRCS offices. The NRCS web site is at http://www.wa.nrcs.usda.gov/nrcs/NRCStxtOnly.htm. Contact names and numbers are provided for each regional office.

Hydrologic Soil Groups

Instructions on how to use the Soil Survey are usually on the first page of the soil survey. To determine soil group, locate the project site on the NRCS map and identify the soil classification. Soil mapping unit descriptions give a general ranking of soil permeability, runoff potential, and the potential for water erosion. The erosion potential is mostly described for agricultural and logging practices, but contains information that also applies to construction.

Soils are categorized into four hydrologic soil groups to estimate runoff volumes. Identifying the hydrologic soil group is one of the best ways to make an initial assessment of whether or not a site has a high risk for erosion and water quality problems. Soil groups are described below, and risk factors associated with each group are presented in Table 2.2.

Group A soils have a high infiltration rate when thoroughly wet. These consist mainly of deep, well-drained sands or gravelly sands. Group A soils tend to have low runoff volumes and water is easily infiltrated. Runoff tends to be clean or easily cleaned with detention. Erosion is usually limited unless concentrated flows run across slopes.

Group B soils have a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep, moderately well drained soils that have moderately fine to moderately coarse textures. These soils tend to have low to moderate runoff volumes and water can usually be infiltrated. Runoff turbidity is variable. Detention may or may not remove sediments from runoff.

Group C soils have a low infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water, or soils of moderately fine to fine texture. These soils have moderate to high runoff volumes and water is difficult to infiltrate. Runoff turbidity is usually very high and not readily reduced with detention.

Group D soils have a very low infiltration rate when thoroughly wet. These consist chiefly of clays, soils that have a permanent high water table, soils that have a clay pan, and shallow soils over nearly impervious material. These soils have high runoff volumes and infiltration is usually not feasible. Runoff turbidity is usually very high and detention has little effect in removing turbidity. Group D soils usually have seasonal high water tables and become unworkable for long periods when saturated.

Table 2.2

Soil Group, Properties, and Related Risk

Soil Group	Properties	Erosion Risk Factor Low-Medium-High
Group A	Infiltration Rate: High Texture: Moderately fine to moderately coarse Erodibility: Low unless concentrated flows Runoff Volume: Low Turbidity: Low	Low
Group B	Infiltration Rate: Moderate Texture: Moderately fine to moderately coarse Erodibility: Low to Moderate Runoff Volume: Low to moderate Turbidity: Variable	Medium
Group C	Infiltration Rate: Low Texture: Moderately fine or fine Erodibility: Low to moderate Runoff Volume: Moderate to high Turbidity: Very high	High
Group D	Infiltration Rate: Very low Texture: Very fine Erodibility: Low to Moderate Runoff Volume: Very high Turbidity: Very high	High

Additional Tables

County soil surveys often provide numerous tables giving details about particular soils concerning erodibility, hydrologic category, infiltration rates, and groundwater conditions. Select tables that could be useful in evaluating risks or choosing BMPs when preparing the TESC plan are described below.

Sanitary Facility. This table describes how well particular soils percolate and whether or not they are suitable for installing septic systems. This information helps one determine if infiltration is an option worth considering on a site. Naturally, permanent facilities would first require testing by the materials lab.

Water Management. This table provides information on how well soils are suited for ponds, levees, terraces and grassed waterways. Information on percolation rates, piping, seepage, erodibility and seasonal flooding are provided.

Physical and Chemical Properties of the Soils. The parameters in this table that are useful in determining the erosion potential are soil depth, clay percent, permeability, available water capacity, and erosion factor K, clay percent and permeability can all be examined together to predict the volume of runoff and to evaluate whether water will percolate/infiltrate throughout the soil profile.

The erosion factor K is very useful for construction sites. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is used in the Universal Soil Loss Equation as an index of susceptibility of bare soil to erosion. It is used to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. Values of K range from 0.02 to 0.69, where the higher the value the more susceptible the soil is to sheet and rill erosion.

2.3.2 Weather-related Risks

It important is to know the local precipitation patterns when preparing and implementing TESC plans. The frequency, intensity and duration of rainfall events all affect the potential for erosion on a site. All three factors must be evaluated to accurately assess the potential for erosion. Weather is one factor that we cannot control while building a project, but we can minimize erosion through proper timing, phasing, and BMP selection if we know the general weather patterns. Seasonal variations for each of these factors must also be considered when determining the scheduling or phasing of a project.

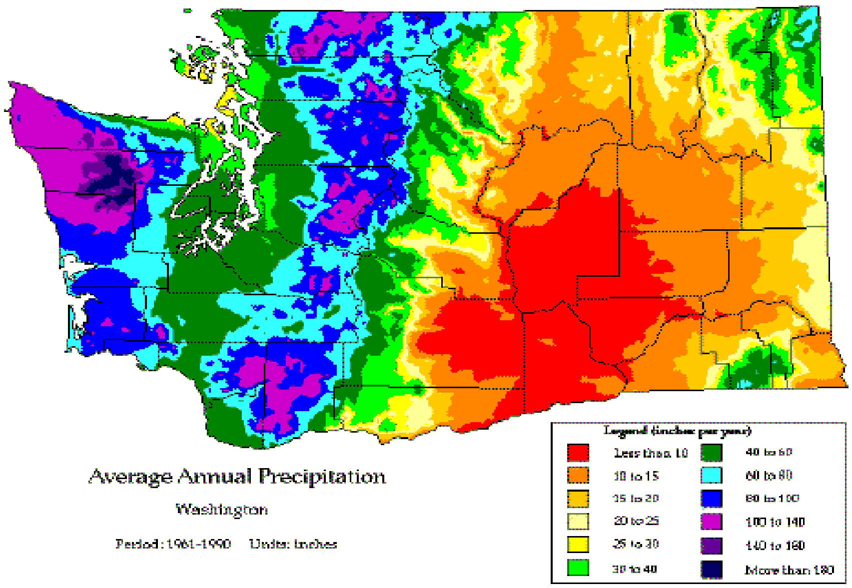
Table 2.3
Rainfall Factors that Affect Erosion Potential

Frequency - A higher frequency of rainfall events exposes a site to a greater potential for erosion.
Intensity - High intensity rainfall events have the greatest potential for erosion for two reasons. First, high intensity rainfall causes the most severe raindrop erosion. Secondly, high intensity rainfall events create flashy, large runoff volumes that can cause damaging rills and gullies.
Duration – Long duration rain events thoroughly saturate soils increasing the runoff/erosion potential. Saturated soil conditions increase the potential for both increased surface runoff volumes and slope failures. A given amount of rainfall at the end of prolonged rain event often does much greater damage than the same amount of rain at the beginning of the rain event.

Available Tools for Estimating Risks Due to Rainfall. The Hydraulics Manual (Chapter 2 Appendix 2-2) contains the isopluvial maps for mean annual precipitation, design storm events, and mean annual runoff that can all be used to get a general idea about the rainfall patterns in any given part of the state.

Available Rainfall Data on the Internet. There is a wealth of readily available weather data on the Internet. The Western Regional Climate Center has statistical information on precipitation, temperature, and several other measurements for over 200 sampling stations throughout the state available on their web site. Included on their site is tabular and graphical information as well as interactive probability graphing capabilities. These graphs can be easily copied and pasted into Temporary Erosion and Sediment Control Plans.

Figure 2.1
Average Annual Precipitation in Washington from 1961 through 1990



The web address for the Western Regional Climate Center is: http://www.wrcc.dri.edu/summary/climsmwa.html.

Average monthly totals give a good starting point to determine how projects should be phased and at what times of year the site should be most heavily protected.

Figure 2.2
Average Total Monthly Precipitation for Mill Creek, Washington

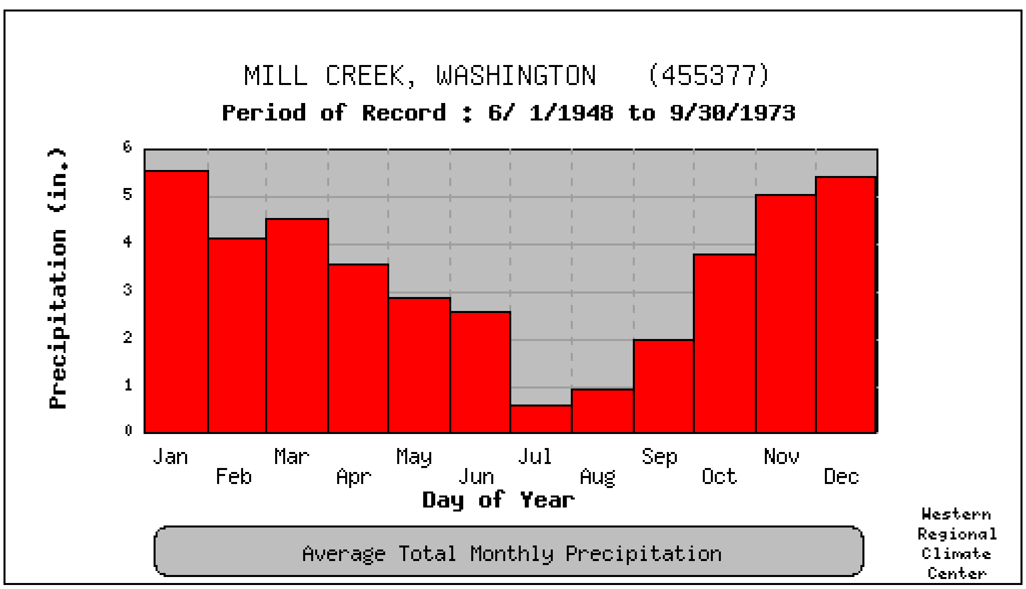
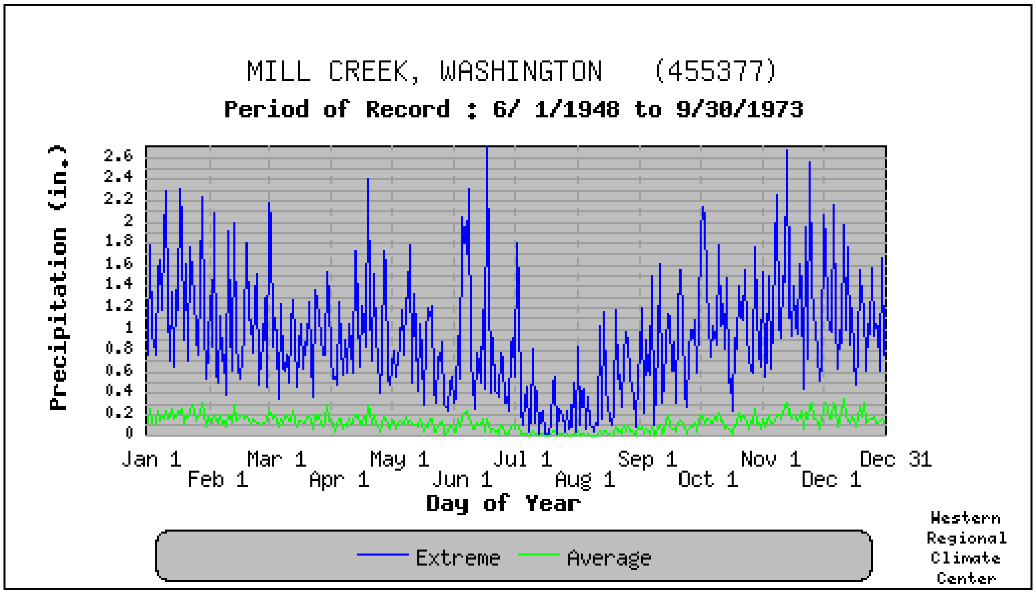


Figure 2.3
Extreme and Average Precipitation Events, Mill Creek, Washington



Extreme events, not averages, are responsible for severe erosion problems. Note that the frequency of extreme events is highest during the wet season, yet extreme events happen throughout the year. The probability of extreme events can be easily created to assess the probability of any rainfall amount over any given time period.

Figure 2.4
One-day Precipitation Probability, Mill Creek, Washington

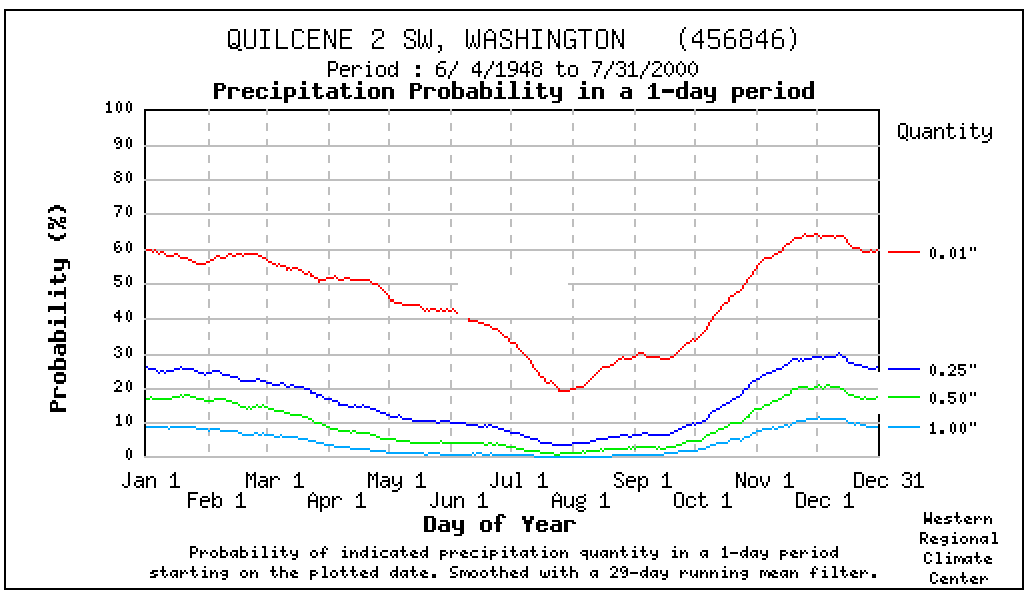
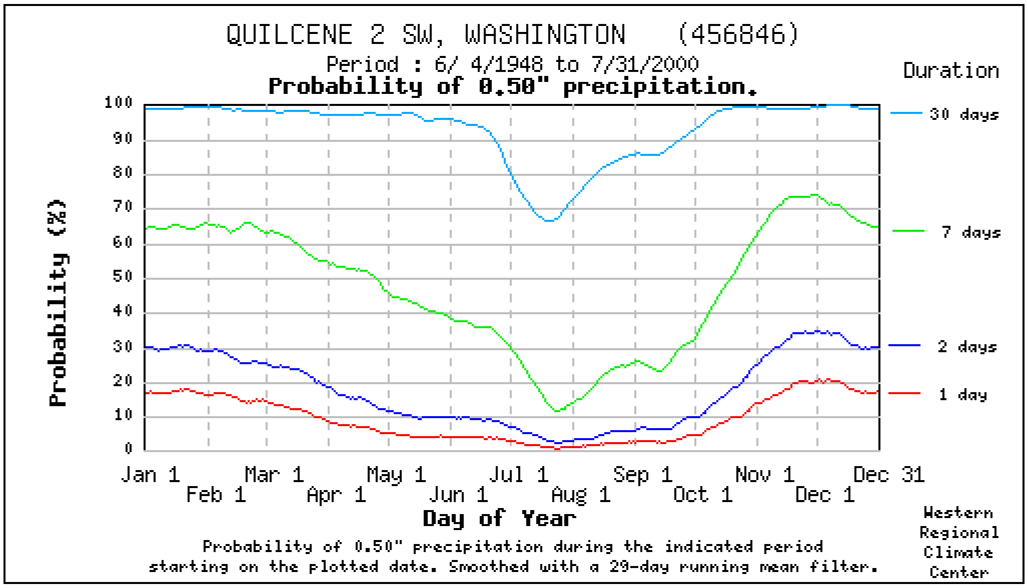


Figure 2.5
Probability of 0.50" of Precipitation, Mill Creek, Washington



2.3.3 Topography

The size, gradient, and stability of slopes in the project work area should be evaluated to assess the potential risks during construction. The potential for erosion increases exponentially with increasing slope length and gradient. With increased slope lengths and gradients, runoff travels faster with more erosive energy. Higher velocity runoff forms rills and gullies that concentrate erosive flows and energy even further. Whenever slopes are created with Hydrologic Group C or D soils, there is an increased risk of large slope failures, especially when silts contents exceed 30 percent. All soil types, however, including sands and gravels, are vulnerable to rapid rill and gully erosion when concentrated flows are not diverted away from steep or long slopes. In addition, groundwater seepage greatly increases the potential for slope failures on all soil types.

When evaluating site topography, one should always try to identify areas that can be used to reduce the risk of turbid water discharges. Closed depressions, flat areas or gently-sloped/heavily-vegetated areas can often be used to treat runoff and eliminate the risk of turbid water discharges during construction.

2.3.4 Flowing Water

When water becomes concentrated in a channel it travels up to 30 times faster than sheet flow and has a much greater potential for causing erosion. The likelihood that surface runoff will become concentrated is influenced by surface permeability and gradient. The steeper the slopes and the overall grade of the site should be considered in determining the potential for harmful concentrated flows.

Rain falling on the exposed portion of a site can concentrate into channels and cause significant damage, but greater damage is often caused by water flowing onto bare soil from existing impervious surfaces within the right of way or from adjacent properties. Impervious surface runoff is immediate and usually results in concentrated stormwater discharges during a rainfall event. Runoff patterns from impervious surfaces must be carefully evaluated to determine if erosion will occur where it leaves the impervious surface. If runoff flows directly onto bare soils then the risk of damage occurring is high. Difficulty of diverting clean water from impervious surfaces during construction should be considered when determining risk. The risk is often highest in the latter part of construction when the new surfaces are installed, but the curbs, conveyances and slopes are not fully stabilized.

Offsite water that runs onto a project can cause a tremendous amount of damage because the contributing area can generate stormwater volumes that far exceed the capacity of the stormwater conveyance and treatment BMPs. Some of the largest erosion related cost overruns and fines ever experienced by WSDOT were related to offsite water entering construction sites. Offsite water sources may include natural sheet flow from adjacent properties, permitted or illicit stormwater outfalls from neighboring buildings and parking lots, groundwater seeps, neighboring construction projects, or unmapped seasonal drainage. The amount of potential offsite water must be determined to evaluate the potential of offsite water to overwhelm detention facilities and conveyances. The risk of site damage from offsite flows is especially high if offsite water crosses slopes because slope cover BMPs can't adequately protect a slope from concentrated runoff.

In order to evaluate the potential for offsite stormwater problems the following actions should be taken:

- Stormwater site plan calculations estimating runoff from offsite drainage basins should be used when prescribing temporary measures.

- Maintenance personnel should be consulted concerning drainage patterns and general volumes.

- Walk the site during a rainstorm and confirm runoff patterns.

2.3.5 Groundwater

Knowledge of groundwater levels on or near your construction site can play a major role in sizing of temporary ponds, predicting if stormwater infiltration will be an effective water management tool, and timing of construction. The groundwater levels can usually be determined from the geotechnical survey of the site. County Soil surveys also provide general information on groundwater levels, including the seasonality of high water tables. Keep in mind that groundwater levels can fluctuate greatly throughout the year, and that data from the winter (wet season) is the most important in determining your level of risk associated with groundwater. The probability of intercepting damaging groundwater seeps and springs can be evaluated using the geotechnical report and also by tracing onsite surface water sources. To further evaluate your risk you can research past WSDOT projects in the area and call project engineers to see whether groundwater problems were encountered, or caused construction delays. The level of difficulty to de-water an excavation must be considered and evaluated in assessing the risk of managing groundwater.

2.3.6 Sensitive Areas

If there are sensitive areas on or around the project site, special precautions must be taken to minimize erosion during construction. Stream and wetland boundaries must be delineated and shown with their buffer zones on the plan. Perimeter control BMPs such as clearing limits fence, silt fences, vegetated buffer strips, etc., should always be placed between the site and downslope sensitive areas.

Always refer to environmental studies and permits if completed. They often provide an assessment of how sensitive the receiving waters are and what measures are required as conditions of the project. Regional environmental staff should be consulted if the studies and permits are not yet completed.

When working around a sensitive area, it is very important to keep public perception in mind. High visibility sites in controversial areas tend to get numerous complaint calls if BMPs are not visible to the driving public. These calls spur intense scrutiny from regulators. Provide for extra mobilizations for mulching, seeding or application of other BMPs on your project if such a scenario is likely.

2.4 Available WSDOT Resources

There are a number of individuals and departments that can provide you with information about your project site and about specific TESC plan components. Some of these resources are included below.

Regional Environmental Staff

Regional environmental offices can help when assessing what level of effort and types of slope stabilization products may be needed to stabilize a site. They routinely respond when corrective actions are required by regulators on problem projects and can often specify potential solutions based on past problems. They also obtain the construction permits, so they are aware of specific permit requirements.

Regional Materials Engineers

Regional materials engineers should be consulted when soil conditions are poor or large cuts or fills are anticipated (Design Manual Section 5-10). The regional materials engineer may consult with the OSC materials lab if conditions warrant additional evaluation. Materials lab engineers determine acceptable slope angles and lengths and whether or not terracing will be required. They can also help design dewatering systems when working in areas with high water tables or seeps. Materials lab engineers may also recommend final slope stabilization materials.

Regional Maintenance Offices

Maintenance personnel should be consulted concerning drainage issues as early as possible. If there has been a history of erosion-related drainage problems in the area, maintenance will be able to identify them. Even if there has not been a history of problems, maintenance can usually describe the drainage patterns and expected stormwater volumes based on years of observation. Maintenance offices also are often aware of local groundwater levels and sensitive area issues.

Regional Landscape Offices

Regional landscape offices may be consulted to assess the level of effort necessary to stabilize the site. They can recommend seed mix fertilizers, mulch mixes for optimum growth.

Statewide Erosion Control Coordinator's Office

The statewide erosion control coordinator can help assess the potential for surface erosion on slopes and recommend specific BMPs/slope protection products. They can also help identify areas for temporary dispersal and infiltration of runoff. They will also review plans upon request.

Table 2.4
Technical Assistance for Erosion Control Design

REGION	NAME	POSITION	PHONE
OLYMPIA SERVICE CENTER – ENVIRONMENTAL AFFAIRS OFFICE			
	Richard Tveten John Pearch	Statewide Erosion Control Coordinator Erosion Control Specialist	360-570-6648 360-570-6651
EASTERN			
	Jim Prudente Greg Lahti Sandra Furu Rebecca Smith Sara Jo Schultz Gion Gibson	Regional Environmental Manager Hydraulics Hydraulics Sr. Environmental Planner Environmental Hydraulics Engineer Regional Materials Engineer	509-324-6131 509-324-6246 509-324-6134 509-324-6135 509-324-6138 509-324-6170
NORTHWEST			
	Martin Palmer Rick Johnson Mike Walker Tim Smith	Regional Environmental Manager Stormwater Manager Erosion Control Specialist Regional Materials Engineer	206-440-4548 206-440-4605 206-440-5074 206-768-5907
NORTH CENTRAL			
	Claton Belmont Don Morehouse Jerry Roseburg	Regional Environmental Manager Asst. Environmental Manager Regional Materials Engineer	509-667-3055 509-667-3057 509-667-3035
OLYMPIC			
	Ken Stone Steve Thompson Brad Lindgren Mel Hitzke	Regional Environmental Manager Hydraulics Engineer Design/Erosion Hydraulics Engineer-Operations Regional Materials Engineer	360-357-2660 360-357-2726 360-357-2714 360-704-3213
SOUTH CENTRAL			
	Gary Beeman Jason Smith Ray Yates	Environmental Program Manager Environmental Coordinator Regional Materials Engineer	509-577-1750 509-577-1751 509-575-2528
SOUTHWEST			
	Becky Michaliszyn	Regional Environmental Manager	360-905-2174
	Rich Laing	Regional Materials Engineer	360-905-2232

2.5 Site Erosion Risk Checklist

The previous sections have described resources that are available to assess the inherent risk on a site. This section provides a Site Description and Information Survey to pull together the required information. The survey is designed to ensure that all relevant information is obtained. The Site Erosion Risk Checklist (Table 2.4) is used to assign a relative ranking of risk for different factors at the site based on the information gathered and applying professional judgment. After evaluating the risk as low, medium, or high, the proper BMPs or design features can be implemented to ensure that the 13 minimum requirements are addressed.

SITE DESCRIPTION AND INFORMATION SURVEY

This Site Description and Information Survey Form is intended to assist you in obtaining and recording information regarding the project site. This survey should be conducted with a site map in hand. This form will help you describe the site as well as identify potential risk areas and environmental sensitive areas. This form has been developed as a checklist to help prompt you to identify important information that is needed for developing a TESC plan. Much of the information may be obtained while still in the office but it is essential to verify all information in the field. ***Each of the following categories of information should be identified and assessed.***

Project Information

Name of Project: ______________________________

Date: ______________________________

Recent Weather Conditions: ______________________________

Soil Type: Check the soil type (or combination of types) that best describes the soil found on site, or give the soil classification (if known). Describe the soil, if necessary.

❑ Gravel ❑ Gravelly Sands/Sandy Gravels ❑ Sand ❑ Silty Sands/Sandy Silts

❑ Silt ❑ Clay ❑ Peat

Soil Classification (if known): ______________________________

Jar Test Results: ______________________________

Slope Stability: ______________________________

Infiltration Area: ______________________________

Topography: Area Wide Topography: ______________________________

General Site Basin or Slope Direction: ______________________________

Cut and Fill Slopes: ______________________________

Other: ______________________________

Drainage Features: Check the drainage features that are on site. Describe if necessary:

Existing Runoff (ditches, streams): ______________________________

Runoff from impervious surfaces: ______________________________

Temporary conveyances: ______________________________

Final conveyances: ______________________________

Surface: Describe the surfaces on the site (paved, gravel, vegetated). Note locations of paved/unpaved areas and approximate sizes (if applicable) on your site map.
❑ Gravel/Soil ❑ Vegetated/Undeveloped ❑ Capped/Paved (asphalt/concrete)

____

____

____

Adjacent Properties:

Potential impacts from upgradient properties: ____________________________________

Potential impacts to downgradient properties: ____________________________________

Groundwater:

Record the depth to groundwater (if known), or depth at which groundwater is expected to be encountered.

Depth to groundwater (known or suspected): _________________________

Seeps and springs: ____

Low areas with seasonal flooding or high water table: ______________________________________

Surface Water Bodies: Check all surface water bodies that are on site or adjacent to the site. Describe if necessary.

❑ Lakes, ponds
❑ Rivers, streams, creeks
❑ Wetlands, swamp
❑ None
❑ Other________________________________

____

____

____

____

Table 2.5
Site Erosion Risk Checklist

Inherent Level of Risk Associated with a Site	Low	Medium	High	Comments
Soil-related risks How erodible is the soil?				
What is the potential for slides?				
What is the expected turbidity from exposed areas?				
Would detention NOT remove sediment from runoff?				
Do soils lend to high or low runoff volumes?				
What is the potential for dust problems?				
What level of effort would be needed to reestablish vegetation?				
Weather Total rainfall?				
Intensity of rainfall events?				
Probability of rainfall?				
Probability of rain on snow events?				
Intensity/frequency of erosive winds?				
Topography Size, gradient and stability of slopes in work area?				
Size, gradient and stability of slopes above or below the work area?				
What is the potential to trap and treat runoff in natural depressions of flat vegetated areas?				
Flowing Water? Likelihood that surface runoff could cause concentrated flows?				
Likelihood that runoff from impervious surfaces could damage grades and/or water quality?				
How difficult would it be to intercept and divert runoff from impervious surfaces?				
Likelihood of potentially damaging offsite runoff flowing into the construction area?				
How difficult would it be to intercept and divert offsite runoff?				
Potential of offsite water overwhelming detention facilities and conveyances?				
Probability of water damaging conveyances?				
Groundwater Probability of intercepting potentially damaging groundwater seeps and springs?				
Potential of groundwater impacting detention areas and pond effectiveness that would delay construction, and reduce BMP effectiveness?				
Potential for slope failures due to groundwater seeps?				
Probability of encountering a seasonal high water table?				
Level of difficulty to de-water?				
Probability of budget problems and cost overruns due to groundwater?				
Sensitive Areas Likelihood that runoff could impact to State waters (streams or wetlands)?				
Likelihood that runoff could impact ESA listed fish?				
Potential for damage to adjacent properties?				
Potential for impacts from other neighboring construction projects (trackout, poor BMPs)?				

3 BMP SELECTION

3.1 Introduction

This section describes how to select appropriate BMPs for inclusion in the TESC plan to meet the 13 minimum requirements. The design, procedural, and physical BMPs are described and prioritized. Tables are provided for each BMP group to help select BMPs to minimize erosion.

3.2 BMP Selection Criteria

There are three types of erosion prevention BMPs that must be considered in TESC planning. These are design, procedural and physical BMPs. Each of these BMP types must be included in an effective erosion control plan. BMP selection should be based on preventing erosion rather than the treatment of turbid runoff as the result of erosion. The three types are discussed below.

3.3 Project Design BMPs

A project design that minimizes erosion control risks can greatly reduce erosion complications both during and after construction. All possible measures should be taken to minimize clearing and grading which exposes the site to erosion. Projects should be designed to integrate existing land contours as much as possible and minimize the angle and lengths of slopes. Project drainage design should consider water generated both on and off of the site that can impact erosion potential.

Table 3.1
Examples of Design BMPs in Relation to Minimum Requirements

BMP	Minimum Requirements Addressed (partially)
Minimize clearing and grading	All TESC Minimum Requirements
Integrate existing land contours; minimize slope angle and length	Min Req. #5 Cut and Fill Slopes
Design drainage to account for on-site and off-site water sources	Min Req. # 4 Timing and Stabilization of Sediment Trapping Measures Min Req. # 6 Controlling Off-Site Erosion Min Req. # 7 Stabilization of Temporary Conveyance Channels and Outlets
Design dewatering system that maintains water quality	Min Req. # 12 Dewatering Construction Sites
Slope roadway or add curbs to keep runoff away from steep slopes, provide adequate detention and outlet protection	Min Req. # 3 Protect Adjacent Properties Min Req. #5 Cut and Fill Slopes

3.4 Procedural BMPs

How and when a project is built can greatly affect the potential for erosion. Sequencing and scheduling are some of the most important aspects of erosion control planning. Construction sequencing should minimize the duration and extent of soil disturbance. Whenever possible, major soil disturbing activities should be done in phases to minimize exposed areas. Likewise, major grading operations should be limited to the dry season.

An effective schedule prevents the site from becoming overexposed to erosion risks. The construction schedule should tie the installation of erosion control BMPs to the order of land disturbing activities. The types of activities that should be included in the schedule are:

- Installation of perimeter control and detention BMPs prior to soil-disturbing activities
- Phasing and timing of clearing, grubbing, and grading
- Interim BMP strategies
- Installation of permanent BMPs and a description of how temporary BMPs have been coordinated with the development of permanent measures
- Erosion control inspection and maintenance schedule

Table 3.2
Examples of Procedural BMPs Related to Minimum Requirements

BMPs	TESC Minimum Requirement Affected
Schedule soil-disturbing activities in phases to limit open areas. Limit soil-disturbing activities to dry season.	All minimum requirements
Require implementation of Puget Sound Condition for unworked soils: October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days; from May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days.	Min Req # 1 Stabilization and Sediment Trapping
Mark clearing limits, sensitive areas, and buffers.	Min. Req. #2 Delineate clearing and easement limits Min. Req. #3 Protect Adjacent Properties
Install detention pond and perimeter control BMPs prior to grading.	Min Req. # 4 Timing and Stabilization of Sediment Trapping Measures Min. Req. #3 Protect Adjacent Properties
Phase construction of cut and fill slopes, build using terraces, cover as completed, route water away from slope.	Min Req. # 5 Cut and Fill Slopes
Provide conveyances and adequate detention, and stabilized outfall BMPs prior to major earthwork.	Min Req. # 6 Controlling Offsite Erosion
Install stable conveyances to direct runoff to detention facilities as areas are cleared.	Min Req. # 7 Stabilization of Temporary Conveyance. Channels and Outlets Min. Req. #3 Protect Adjacent Properties
Divert clean water running onto the site around construction.	Min Req. # 7 Stabilization of Temporary Conveyance Channels and Outlets
Require physical inlet protection BMPs.	Min Req. # 8 Inlet protection

BMPs	TESC Minimum Requirement Affected
Do not open more than 500 feet of trench at one time. When feasible, place excavated materials on uphill side of trench consistent with safety and space considerations.	Min Req. # 9 – Underground Utility Construction
Limit traffic to construction accesses and haul roads.	Min. Req. # 10 Construction Access Routes
Require BMP removal only after site is stabilized.	Min. Req. # 11 Removal of Temporary BMPs
Require dewatering to discharge water in a manner that does not impact receiving waters. Infiltrate whenever possible.	Min. Req. # 12 Dewatering construction sites Min. Req. #3 Protect Adjacent Properties
Require inspection and maintenance of BMPs.	Min Req. # 13 Maintenance of BMPs

3.5 Physical BMPs

Physical BMPs include all of the erosion and sedimentation control measures that are physically put in place after all possible design and procedural BMPs have been considered. Physical BMPs should be considered as a supplement to and not a replacement for the design and procedural BMPs. The Physical BMPs are listed in Table 3.3 and described in both the Highway Runoff Manual and Washington State Department of Ecology Stormwater Management Manual for Western Washington. Properly installed and maintained physical BMPs can greatly reduce erosion where design and procedural BMPs have been implemented. In most cases, however, physical BMPs alone cannot adequately prevent erosion or water quality violations if design or procedural BMPs are not employed. Eleven of the potential erosion control and sediment problems, and selection criteria for physical BMPs to address the problems, are presented in Table 3.4.

Table 3.3
Physical BMPs and Related TESC Minimum Requirements

BMP	TESC Minimum Requirement Affected
Stabilization E1.10 – Temporary Seeding of Stripped Areas, E1.15 – Mulching and Matting E1.20 – Plastic Covering, E1.25 – Preserving Vegetation, E1.30 – Buffer Zone, E1.35 – Permanent Seeding and Planting, E1.40 – Sodding, E1.45 – Topsoiling, C126 – Polyacrylamide for Soil Erosion Protection, C130 - Surface Roughening **Sediment trapping** E 3.10 – Filter Fence, E3.15 – Straw Bale Barrier, E 3.10 – Brush Barrier, E3.25 – Gravel Filter Berm, E3.35 – Sediment Trap, E3.40 - Temporary Sediment Pond, C250 – Construction Stormwater Chemical Treatment**,** C251 - Construction Stormwater Filtration	Minimum Requirement #1 – Stabilization and Sediment Trapping
E1.25 – Preserving Natural Vegetation, E1.30 – Buffer Zones, C103 – Plastic or Metal Fence, C104 – Stake and Wire Fence	Minimum Requirement #2 – Delineate Clearing and Easement Limits
E3.35 – Sediment Trap, E3.40 - Temporary Sediment Pond	Minimum Requirement #3 – Protection of Adjacent Properties
Timing is a procedural issue. Stabilize side slopes with BMPs associated with Minimum Requirement #1.	Minimum Requirement #4 Timing and Stabilization for Sediment Trapping Measures

BMP	TESC Minimum Requirement Affected
All BMPs for Min Req #1 plus BMP C200 – Interceptor Dike and Swale, BMP C204 – Pipe Slope Drains C131 - Gradient Terraces	Minimum Requirement #5 - Cut and Fill Slopes
E1.25 – Preserving Vegetation, E1.30 – Buffer Zone, E3.40 - Temporary Sediment Pond, C209 - Outlet Protection**,** C233 - Vegetated Strip	Minimum Requirement #6 – Controlling Off-Site Erosion
C201 – Grass-Lined Channel, C202 – Riprap Channel Lining BMP C207 – Check Dams, C208 – Triangular Silt Dike (Geotextile Fabric Check Dam), C209 – Outlet Protection	Minimum Requirement #7 – Stabilization of Temporary Conveyance Channels and Outlets
E3.30 – Storm Drain Inlet Protection	Minimum Requirement #8 – Storm Drain Inlet Protection
This is a procedural issue.	Minimum Requirement #9 – Underground Utility Construction
BMP C105 – Stabilized Construction Entrance, C106 – Wheel Wash, C107 – Construction Road/Parking Area Stabilization	Minimum Requirement #10 – Construction Access Routes
This is a procedural issue.	Minimum Requirement #11 – Removal of Temporary BMPs
E3.35 – Sediment Trap, E3.40 - Temporary Sediment Pond, C250 - Construction Stormwater Chemical Treatment, C251 - Construction Stormwater Filtration	Minimum Requirement #12 – Dewatering Construction Sites
This is a procedural issue.	Minimum Requirement #13 – Maintenance

Table 3.4
Physical Control BMP Selection Guide Based on Potential Problems

#	POTENTIAL PROBLEM SITUATION (Reminder: all erosion BMPs help prevent sediment problems)	RECOMMENDED BMPS
1	Erosion due to rainfall on exposed soils	Preserving Vegetation, Track Walking, Straw, Mulching & Matting, PAM, Temporary Seeding, Hydroseed/Mulch spray mixture, Bonded Fiber Matrix, Plastic, Sodding, Topsoiling, Permanent Seeding and Planting
2	Erosion due to rainfall on short or low gradient exposed slopes	Preserving Vegetation, Track Walking, Straw, Mulching & Matting, PAM, Temporary Seeding, Hydroseed/Mulch spray mixture, Bonded Fiber Matrix, Plastic, Sodding, Topsoiling, Permanent Seeding and Planting
3	Erosion due to long or steep exposed slopes	Preserving Vegetation, Track Walking, Gradient Terraces, Straw, Mulching & Matting, PAM, Temporary Seeding, Hydroseed/Mulch spray mixture, Bonded Fiber Matrix, Plastic, Sodding, Topsoiling, Permanent Seeding and Planting Conveyance – Interceptor Dike and Swale, Pipe Slope Drains
4	Erosion due to concentrated runoff from impervious surfaces flowing onto exposed slopes	Interceptor Dike and Swale, Pipe Slope Drains
5	Erosion due to offsite water running onto exposed slopes as either concentrated flow or sheet runoff	Pipe Slope Drains, Interceptor Dike and Swale
6	Erosion in ditches due to high velocity flows	Check Dams, Sodding, Matting, Rip-Rap Channel Lining, Level Spreader
7	Sediment-laded water leaving the site as sheet flow	Filter Fence, Straw Bale Barrier, Brush Barrier, Gravel Filter Berm
8	Sediment–laden water entering the storm drain	Storm Drain Inlet Protection and New Products, Stabilized Construction Entrance & Tire Wash, Construction Road Stabilization, Early First Asphalt Lift or Gravel Bedding in Areas to be Paved
9	Sediment-laden water leaving the site as concentrated flow	Sediment Trap, Temporary Sediment Pond, Outlet Protection, Chemical Stormwater Treatment
10	Tracking of sediment onto roadways	Stabilized Construction Entrance & Tire Wash, Street Sweeper, Early First Asphalt Lift or Gravel Bedding in areas to be paved, Maintenance of Construction Entrance
11	Discharges of concentrated, high velocity flows causing erosion	Level Spreader, Temporary Sediment Pond, Outlet Protection

[a] When a variety of alternative BMPs can be used to solve a particular problem, refer to the Highway Runoff Manual and Ecology's Stormwater Management Manual for guidance to select the preferred BMP.

4 TESC PLAN TEMPLATE

A TESC plan is prepared for construction staff, contractors, and regulators. The plan is designed to show the contractor when, how and where physical BMPs will be installed. It also demonstrates to the regulators what methods will be used to achieve compliance with water quality laws.

The following section provides a template to use when producing TESC plans. The template was designed using potential narrative discussion ideas and listing BMPs relative to the Minimum Requirements. The Erosion Information Sheets and Erosion Risk Assessment Table (see Chapter 3) contain much of the information required to complete the plan and should be completed prior to using the template. The template does not cover every conceivable situation that may be applicable to the project. Available technical resources should be consulted as needed to address unique conditions. The two major parts of a TESC plan include the narrative section and drawings. Preparation of contract plan sheets is discussed below, and a narrative template is included as the following section.

4.1 Contract Plan Sheet Preparation

The plan sheets are the most important part of the erosion control plan. All temporary and permanent erosion control features shall be shown on the contract plans, and, as necessary, specified in the contract provisions. In addition to the BMPs, plan sheets shall show the clearing and grubbing limits, cut and fill slope lines, topography, impervious surfaces, drainage features, environmentally sensitive areas and associated buffer zones, receiving waters, and stormwater treatment areas.

The plan sheets will be used by the contractor to install the physical BMPs, and by the regulators in evaluating the site for compliance. CADD symbols and details for physical BMPs may be found in the CADD Symbols and Details libraries. Additional CADD symbols and details will be added as necessary, and Standard Plans for BMPs will be developed as the need arises.

4.2 Example Template

The following section provides an example TESC plan template. This template provides text box descriptions at the beginning of each section that describe what information should be included. Examples of descriptive text, in italics, are also provided.

TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN

SR (roadway number)
Stage (number)
(Name of project)
MP to MP

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
(NAME OF REGION)
(Location)

(Name), P.E.
Project Engineer

(Name)
Regional Administrator

(Month Year)

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

1.1 Project Description

In this section you should provide a narrative description of the major features of the project. The first section introduces the project and where the project will be constructed. The second section presents a description of the construction activities. Site conditions that may influence TESC planning are described in the final section of Chapter 1.

The Washington State Department of Transportation (WSDOT) proposes to (describe the modification and the feature that will result in soil disturbance; e.g. add a turn lane, widen the shoulder, replace a bridge) on State Route (SR) (roadway number), from MP (beginning Mile Post number) to MP (ending number). The project location is shown on Figure 1 - Vicinity Map. (On the Vicinity Map show the beginning and ending MP limits of the project and the mileage distances to the nearest municipalities. Include the names of other streets/highways that may be involved. Also show railroads, waterways.)

1.2 Description of Construction Activities

The proposed project covers (acres), will involve (acres) of soil disturbance with approximately (yards) of and cuts and fills. New impervious surfaces (will/will not) be created. If yes, state area and - refer the reader to the SSP. The construction activities will include (Describe the work to be done; e.g., clearing and grubbing, grading, roadway excavation, constructing storm sewers, paving with asphalt or concrete, constructing permanent stormwater detention and infiltration ponds, etc.).

It is anticipated that the project will start on XXX and will be completed on XXX. The project (will/will not) involve wet season work. Major earthwork activities will occur in XXXXX.(use multiple dates if project occurs over multiple years)

1.3 Site Conditions

1.3.1 Soils

Briefly describe soils in terms of erodibility, texture, and hydrologic groups. (Summarize information gathered from the geotechnical report, soil surveys, personal observations like jar tests, or other sources). Provide references to the geotechnical report and soil survey. Provide an assessment of the potential for erosion, infiltration, and the projected effectiveness of detention for removing sediment from runoff. Describe the potential for seasonal or permanently high water tables (shallow groundwater).

Example 1 The dominant soil type is Spanaway sandy gravelly loam. The soil is moderately erodible if exposed to concentrated runoff. The potential for erosion is minimal, however, because the soil is a highly permeable Type A soil. Runoff is expected to be minimal, if any. The texture of the soil is very course sand and gravel with very few fines (silt and clay). Jar tests suggest that if runoff becomes turbid, detention would remove sediment within a few hours.

Example 2 The dominant soil type is Alderwood gravelly loam. The soil is highly erodible and prone to slides because of high silt contents. The soil belongs to the Type C hydrologic group and high runoff volumes are expected. Seasonal groundwater is expected in the winter on top of the hard pan that lies between 20 and 40 inches below the surface. The large percentage of clay in the soil will result in high persistent turbidity if soil is eroded. Jar tests suggest that if runoff becomes turbid, detention would remove sediment after 2 weeks.

1.3.2 Precipitation

Average annual total rainfall at the nearest weather monitoring station (go to http://www.wrcc.dri.edu/summary/climsmwa.html *Insert town) is (insert total). Most rainfall occurs between (dates) (insert monthly total average rainfall map here). The design storm event for erosion control on this site is inches (See Hydraulics Manual, Appendix 2-2, Isopluvials of 2-year 24-hour precipitation) Add additional probability graphs (quantity of rain over time intervals) if it is helpful to illustrate how timing, phasing or cover requirements will help reduce risks.*

1.3.3 Topography

Briefly describe the topography (present and proposed) at the project site. Evaluate the influence topography has on the potential for erosion (present and proposed). Describe larger slopes if present. Identify any areas where existing topography (i.e., like closed depressions) can be used to store or treat runoff.

1.3.4 Drainage

Describe the drainage basins, drainage and treatment features, discharge points and receiving water for each basin. Drainage basins should be shown on the plan sheets. If detailed basin analysis is performed as part of a Stormwater Site Plan (SSP), refer to it. Describe how water drains from existing impervious surfaces and proposed new impervious surfaces in relation to erosion control.

If applicable, include a discussion about off-site water that may enter the project site.
Reminder- has anyone visited the site during a rain event or contacted maintenance and asked about drainage?

1.3.5 Vegetation

Briefly describe vegetation on the undeveloped portions of the site and its ability to prevent erosion and treat runoff during construction.

1.3.6 Sensitive Areas

Describe water bodies, streams or wetlands, and other sensitive areas, etc. on or near the project site. All such areas and their buffers that are on or adjacent to the project must be shown on the plan sheets: If the receiving waters are off site, describe the drainage path leading from the site to the receiving waters. If there are any technical Biology/Wetland/Stream Reports, they will describe sensitive areas and provide details for anticipated impacts. Refer to such reports when present. Attach one of the following descriptions for the receiving water classification.

Surface Water Standards per WAC 173-201A-130.

For Lakes and Class AA and A streams insert (nearly all waters of the state) "Turbidity shall not exceed 5NTU over background when the background turbidity is 50 NTU or less, or have more than a 10% increase in turbidity when the background turbidity is more than 50 NTU."

Option 2: For Class B or C water bodies insert "Turbidity shall not exceed 10 NTU over background when the background turbidity is 50 NTU or less, or have more than a 20% increase in turbidity when the background turbidity is more than 50 NTU."

(If you are in the NW region - State the water body and its classification as posted in the Microsoft Exchange/Water Quality Public Folder/WAC 173-201A Water Quality Standards/WAC 173-201A-130.doc file under the "List of water bodies and their classification".)

1.3.7 Adjacent Areas

Briefly describe adjacent properties and their land uses. Provide an assessment of how sensitive adjacent properties are to offsite erosion or sediment deposition from the site by wind or water erosion.

1.3.8 Overall Erosion Potential Assessment

The potential for erosion to damage this project, surroundings properties and the environment is (low, moderate, high.). This erosion potential was determined based on (Summarize what factors from Table 2.3 in Chapter 3 were used to determine the erosion potential; e.g. slope length and angles, amount of disturbed soil, soils, proximity to receiving water bodies, outfalls, etc.).

1.4 TESC Responsibilities

The responsibilities for implementing the TESC Plan are outlined in Table 1.1 below. The personnel listed in the table are available to provide information for their area of expertise. (Much of the table will be filled in later once the project is awarded.)

Table 1.1 TESC Responsibilities

Affiliation	Title	Name	Phone No.	Responsibilities
WSDOT	Construction Project Engineer			Contract administration; point of contact.
WSDOT	Chief Inspector			Oversees administration of the contract including maintenance, revision, and implementation of the TESC Plan. Ensures that TESC monitoring takes place, certifies compliance with the TESC Plan, and keeps all records.
WSDOT	Regional Environmental Office			Assists the Project Office to ensure compliance with all environmental permits and provides project assistance as needed.
Contractor	Project Superintendent			Contract administration.
Contractor	Erosion and Sediment Control (ESC) Lead*			Ensures that BMPs are in place and functioning as designed; responds to TESC directives from WSDOT; inspects BMPs weekly and following storms; identifies necessary changes to BMPs; and discusses changes of the TESC plan with WSDOT Chief Inspector.
Department of Ecology	Water Quality Inspector			Investigates project practices and discharges to determine whether or not compliance with water quality standards and the TESC Plan is achieved. Contacts WSDOT Project Engineer and Environmental staff regarding compliance.
Environmental Affairs Office	Statewide Erosion Control Coordinator	Richard Tveten John Pearch	360-570-6648 360-570-6651	Provide technical assistance as needed.
Add other if necessary	(county or other local agency)			
* The Contractor designates the ESC Lead. This Lead must be certified through WSDOT's Construction Site Erosion and Sediment Control Course.				

2.0 TEMPORARY EROSION AND SEDIMENTATION CONTROL MINIMUM REQUIREMENTS

This Temporary Erosion and Sedimentation Control (TESC) Plan is designed to establish when, where, and how specific best management practices (BMPs) will be implemented to prevent erosion and the transport of sediment from the site during construction. Due to the unpredictable nature of weather and construction conditions, the TESC plan is a "living document" and is subject to additions and modifications to successfully prevent erosion throughout construction.

Should field conditions during construction require additional BMPs or changes to the temporary BMPs, this plan shall be modified jointly by the WSDOT Project Office Inspectors and Contractor ESC Lead, and submitted to the project engineer for approval. During active work, the Contractor shall keep the TESC Plan and BMP inspection reports on site. When construction activity is complete, the WSDOT Project Office shall retain the TESC Plan, inspection reports, and all other reports required by the contract.

2.1 Required Minimum Requirements

In order to prevent erosion and the transport of sediments from the site during construction, this plan will include the thirteen Minimum Requirements for erosion control plans in the Highway Runoff Manual. The TESC Minimum Requirements that are addressed in this section are as follows:

- Requirement #1 - Stabilization and sediment trapping
- Requirement #2 - Delineate clearing and easement limits
- Requirement #3 - Protection of adjacent properties
- Requirement #4 - Timing and stabilization of sediment trapping measures
- Requirement #5 - Cut and fill slopes
- Requirement #6 - Controlling off-site erosion
- Requirement #7 - Stabilization of temporary conveyance channels and outlets
- Requirement #8 - Storm drain protection
- Requirement #9 - Underground utility construction
- Requirement #10 - Construction access routes
- Requirement #11 - Removal of temporary BMPs
- Requirement #12 - Dewatering construction sites
- Requirement #13 – Maintenance

All of the minimum requirements, if applicable, are addressed using standard BMPs. The BMPs are described in detail in other documents. The BMP numerical listings preceded by an "E" (e.g., BMP E1.10) are from the Highway Runoff Manual, and the BMP numerical listings preceded by a "C" (e.g., BMP C230) are from Washington State Department of Ecology Stormwater Management Manual for Western Washington.

The introductory paragraphs in each of the following sections should be modified as appropriate to include site-specific conditions. The lists include most standard physical BMPs that could be used to address the subject requirement. Each of the minimum requirement sections should include design, procedural, and physical BMPs as appropriate. After describing the design and procedural BMPs that will be employed, list the physical BMPs to be used. Delete (or add to) the physical BMPs from the list provided in the template.

2.1.1 Minimum Requirement #1 - Stabilization and Sediment Trapping

All exposed and unworked soils shall be stabilized by suitable and timely application of BMPs. *Design BMPs addressing the stabilization and sediment trapping minimum requirement include integrating existing contours and minimizing slope angles.*

Procedural BMPs include maximum time limit requirements for leaving soils exposed. In western Washington insert: From October 1 to April 30, no soils shall remain unstabilized for more than two days and from May 1 to September 30, no soils shall remain unstabilized for more than seven days. For eastern Washington indicate whatever soil cover requirements seem appropriate based on local weather conditions.

The physical BMPs selected for this project to address stabilization and sediment trapping requirements are shown on the site plans and include the following: ***(delete all but those to be included in the plan)***

Stabilization

- BMP E1.25 – Preserving Vegetation
- BMP E1.10 – Temporary Seeding of Stripped Areas
- BMP E1.35 – Permanent Seeding and Planting
- BMP E1.15 – Mulching and Matting
- BMP E1.40 – Sodding
- BMP E1.45 – Topsoiling
- BMP C126 - Polyacrylamide for Soil Erosion Protection
- BMP E1.20 – Plastic Covering

Sediment Trapping

- BMP E 3.10 – Filter Fence
- BMP E3.15 – Straw Bale Barrier
- BMP E 3.20 – Brush Barrier
- BMP E3.25 – Gravel Filter Berm
- BMP E3.30 – Storm Drain Inlet Protection
- BMP C130 - Surface Roughening
- BMP E3.40 - Temporary Sediment Pond

- BMP C131 - Gradient Terraces
- BMP C206 – Level Spreader (Water Bars)
- BMP C209 - Outlet Protection
- BMP C250 - Construction Stormwater Chemical Treatment
- BMP C251 - Construction Stormwater Filtration
- BMP E3.35 – Sediment Trap

2.1.2 Minimum Requirement #2 - Delineate Clearing and Easement Limits

Example verbiage for design and procedural BMPs is presented below.

Existing vegetation (trees, bushes, shrubs, grasses) shall be preserved when removal is not necessary for the construction of the project. The Contractor is required to survey, stake, and flag the clearing limits shown in the Plans and/or areas not to be disturbed including easements, setbacks, sensitive and critical areas and their buffers, and drainage courses before any clearing or grubbing can begin. The physical BMPs to satisfy Minimum Requirement #2 include: ***(delete all but those to be included in the plan)***

- BMP E1.25 – Preserving Natural Vegetation
- BMP E1.30 – Buffer Zones
- BMP C103 – Plastic or Metal Fence
- BMP C104 – Stake and Wire Fence

2.1.3 Minimum Requirement #3 - Protection of Adjacent Properties

Properties adjacent to the project site shall be fully protected from erosion and sediment deposition. State what special precautions will be taken to protect adjacent properties. Nearly all physical BMPs could be employed to protect adjacent properties – refer to the minimum requirements when appropriate to avoid repeating information. Discuss design and procedural BMPs.

2.1.4 Minimum Requirement #4 - Timing and Stabilization of Sediment Trapping Measures

Sediment ponds and traps, perimeter dikes, sediment barriers, and other BMPs intended to trap sediment on site shall be installed and functional as a first step of construction prior to any other land disturbing activities. State what will be done to ensure that ponds are installed and stabilized prior to major soil disturbing activities. State how the pond slopes will be stabilized.

2.1.5 Minimum Requirement #5 - Cut and Fill Slopes

If there are cut and fill slopes on the site, state what measures will be taken to protect them. The initial paragraph should describe design BMPs (terraces, sloping roadways to direct runoff away from fills, draining water away from fill slopes with curbs, etc.). The second paragraph should include a description of the procedural BMPs for preventing erosion on slopes, such as phasing requirements. (e.g., state what limits are to be imposed for: 1) time of year major slope work will be allowed, 2) maximum amount of slope work to be allowed at one time, 3) procedures for protecting slopes if wet weather interrupts work., and 4) time requirements for stabilizing slopes during and after slope construction).

Example: Cut and fill slopes shall be constructed in a manner that will minimize erosion. Slopes exceeding 100 feet in length will be terraced. All slope construction work will be performed between May 1 and October 15. No more than (1/3, 5 acres, or whatever) of slopes will be exposed at the same time. All surface runoff will be routed away from exposed soils using curbs and interceptor dikes, and conveyed to the base of the slope using slope drains. Slopes will be track walked when at finish grade or whenever they will be left unworked for XXX days. Final stabilization BMPs will be installed with XXX days of slope completion using XXX.

The following physical BMPs will be implemented to minimize erosion on cut and fill slopes: ***(delete all but those to be included in the plan)***

- BMP C130 – Surface Roughening
- BMP C131 – Gradient Terraces
- BMP C200 – Interceptor Dike and Swale
- BMP C204 – Pipe Slope Drains
- BMP C205 – Subsurface Drains
- Soil cover requirement BMPs listed under Minimum Requirement #1

2.1.6 Minimum Requirement #6 - Controlling Off-Site Erosion

State what BMPs will be employed to prevent offsite erosion. Include strategies to minimize runoff volumes by preventing increases runoff volumes and velocity (e.g., dispersal/infiltration). If dispersal/ infiltration will be used describe briefly.

Example: Properties and waterways downstream from the project shall be protected from erosion by preventing increases in volume, velocity and peak flow rates. Increases in storm water volumes will be minimized by preserving vegetation, track walking exposed slopes, and by applying PAM. Runoff volumes will be reduced by infiltration and/or dispersal into vegetated strips. All runoff in Basin XXX will be infiltrated. Peak storm water flows will be detained in the temporary sediment ponds.

Physical BMPs that will be used to prevent offsite erosion include: ***(delete all but those to be included in the plan)***

- BMP E1.25 – Preserving Vegetation
- BMP E1.30 – Buffer Zone
- BMP C233 - Vegetated Strip
- BMP E3.35 – Sediment Trap
- BMP E3.40 - Temporary Sediment Pond
- BMP C126 - Polyacrylamide for Soil Erosion Protection
- BMP C130 - Surface Roughening

2.1.7 Minimum Requirement #7 - Stabilization of Temporary Conveyance Channels and Outlets

Describe what will be done to prevent erosion in channels and outlets.

Example: All temporary conveyance channels and outfalls shall be stabilized to prevent erosion and reduce sediment transport from the site. XXXX (insert channel lining materials) will be used to protect channels from anticipated erosive forces. XXXX (rock, sand, geotextile silt dikes,) check dams will be installed to reduce erosive forces in the conveyances and capture sediment. Erosion will be prevented at all outlets using XXXX.

Physical BMPs that will be implemented include the following: ***(delete all but those to be included in the plan)***

- BMP C202 – Riprap Channel Lining
- BMP C206 – Level Spreader (Water Bars)
- BMP E 2.60 – Check Dam
- BMP E1.35 – Permanent Seeding and Planting
- BMP E1.15 – Mulching and Matting
- BMP E1.40 – Sodding
- BMP C209 – Outlet Protection

2.1.8 Minimum Requirement #8 - Storm Drain Inlet Protection

Describe the BMPs that will be used for storm drain inlet protection.

Example: Sediment will be kept out of storm drains by protecting inlets. XXXX (sand bag checkdams, catch basin inserts) will be used to protect drains along curbs. XXXX (inserts) will be used on streets open to traffic. XXX will be used in areas closed to traffic.

The following physical BMPs are shown on the site drawings.

- BMP E3.30 – Storm Drain Inlet Protection
- BMP E 2.60 - Check Dam

2.1.9 Minimum Requirement #9 - Underground Utility Construction

This Minimum Requirement applies only to Western Washington. Indicate NA if not applicable

<*Insert the following if in Western Washington:*> - No more than 500 feet of trench shall be opened at one time. Where consistent with safety and space considerations, excavated material shall be placed on the uphill side of the trench. If water is turbid, all de-watering devices shall discharge into a sediment trap or sediment pond.

If the project is Eastern Washington, state whatever is reasonable.

2.1.10 Minimum Requirement #10 - Construction Access Routes

Describe how construction access will be controlled and what measures will be conducted to limit track out.

Example: Tracking of sediment onto paved roads will be minimized. All traffic on and off of the site will be restricted to stabilized construction entrances (add wheel wash if necessary). Traffic within the site will also be limited to stabilized construction roads. If any sediment is transported onto a road surface, the road shall be cleaned thoroughly at the end of each day. Sediment shall be removed from roads by shoveling or sweeping.

Physical BMPs that will be used at the site are shown on the site drawings and include the following.

- BMP E2.10 – Stabilized Construction Entrance
- BMP E2.15 – Construction Road Stabilization

2.1.11 Minimum Requirement #11 - Removal of Temporary BMPs

Add descriptive text here as required

Example: All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or when the Engineer determines that the temporary BMP is no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

2.1.12 Minimum Requirement #12 - Dewatering Construction Sites

This Minimum Requirement applies only to Western Washington. Modify as appropriate in Eastern Washington. Infiltration of dewatering water is encouraged.

If applicable: *State how water from dewatering activities will be treated and discharged from the site. The example below is from the* Department of Ecology's Draft Stormwater Management Manual for Western Washington *and will soon apply to western Washington. The guidelines are appropriate for use anywhere in the state.*

Example: Clear de-watering water will be discharged to XX ("clean water should not be mixed with turbid water, and can be discharged to systems that are tributaries to waters of the State as long as we do not cause erosion or flooding of receiving waters" Quote from Aug 2000 Draft DOE manual. – in other words bypass the detention pond but don't discharge too much water too fast.)

Turbid de-watering water (similar to site runoff) will be conveyed to and treated within the sediment control BMPs prior to discharge from the site.

Extremely turbid water (water from well drilling operations, etc.) shall be treated separately from site runoff.

Physical BMPs shown on the site drawings that will be implemented to treat dewatering water include: ***(delete all but those to be included in the plan)***

- BMP E 2.60 - Check Dam
- BMP C233 - Vegetated Strip
- BMP E3.35 – Sediment Trap
- BMP E3.40 - Temporary Sediment Pond

2.1.13 Minimum Requirement #13 - Maintenance

Indicate a minimum schedule for maintenance of BMPs, including a reference to completing the necessary paperwork.

Example: All temporary and permanent erosion control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. The Erosion Control lead will inspect all BMPs weekly and daily during runoff producing rain events. Maintenance activities will be completed within 24 hours of the inspection. An inspection and maintenance report will be prepared following each inspection. Specific maintenance requirement for each BMP will be performed according to WSDOT's standard specifications associated with each BMP and the maintenance guidelines in the Highway Runoff Manual.

The erosion control lead will visually check site discharge during each inspection. If any turbid discharges are observed, the chief inspector or project engineer will be notified immediately and corrective actions will be prescribed. Whenever a site-inspection reveals that a BMP is inadequate to prevent erosion or sediment discharge, the Contractor and WSDOT shall jointly modify the TESC plan.

3.0 SCHEDULE

State how the project will be scheduled and staged to prevent erosion. *The following example text should be revised to reflect the project specific proposed erosion control measures related to construction.*

Example: The following is a general schedule guideline for implementing TESC BMPs during construction of this project. Construction is anticipated to begin in XXX and end in XXX with the major soil disturbing activities in XXX to avoid the wet season. Construction will be staged to minimize the extent and duration of soil exposure. The Project Engineer will have final authority over scheduling and implementation of temporary BMPs during construction. (State how the project will be phased to disturb minimum portions of the site for the shortest amount of time during construction.)

1) Prior to site any work, WSDOT will <u>verify</u> the following:
   - The point(s) at which concentrated site runoff leaves the project boundary and/or enters surface water resources.
   - Background conditions and downstream compliance points for water quality.
   - Locations where off-site stormwater can enter the project so that it can be diverted around the site (if applicable).
   - Clearing limits
2) Prior to any soil disturbing activities the contractor shall install:
   - Storm drain inlet protection BMPs
   - Perimeter control BMPs (construction entrances, silt fences, clearing limit fences, bale barriers, brush barriers etc.)
   - Diversion measures for off-site water (if applicable)
3) Prior to any other grading activities, temporary sediment/detention ponds will be excavated and pond embankments will be protected. Clearing and grading of the site will be phased such that runoff from exposed areas will flow through stabilized conveyances to functioning sediment control BMPs.
4) Only after TESC measures for each phase of construction are in place, will major construction excavation begin.
5) Additional erosion and sedimentation control facilities will be installed as needed throughout construction.
6) BMPs will be maintained as necessary.
7) Replace temporary BMPs with permanent BMPs as construction allows.
8) Once all permanent construction is completed, and permanent BMPs functioning properly, the remaining TESC facilities will be removed within 30 days and their locations stabilized.

4.0 REFERENCES

List all applicable references used in the preparation of this TESC Plan. Below is an example list.

Washington State Department of Transportation, Highway Runoff Manual. August 2000.

Washington State Department of Ecology, Stormwater Management Manual for Western Washington, Final Draft. August 2000. Publication 99-12.

National Resource Conservation Service, Soils Survey of ___________ County Area Washington, month, 19__.

APPENDICES

Appendix A: TESC Plan Sheets and Details

Appendix B: Sample TESC Monitoring and Maintenance Inspection Sheet

Appendix B:

Sample TESC Monitoring and Maintenance Inspection Sheet

Inspector(s):________________________________ Date:__________________________

Site Name and Location:____

Current Weather Conditions:___________________ Last 24 Hours:__________________

BMP Designation	O.K.	Not O.K.	BMP Condition, Corrective Action, General Notes
Soil Stabilization			
Perimeter Control			
Construction access			
Stability of Conveyances			
Water Management			
Inlet protection			
Outlet Protection			
Stormwater Detention			
Dust control			
Site Discharge			
Receiving waters			

5 SCOPING AND BUDGETING

The discussion in Section 1 included a summary of past actual erosion control costs versus budget amounts. Some cost overruns were due to unforeseen and uncontrollable conditions but most problems were due to inadequate risk assessment and planning. Employing effective scoping and budgeting strategies during TESC planning can provide construction with the resources they need to minimize or eliminate costly erosion and sedimentation problems. This section presents some strategies and considerations for TESC planning.

5.1 Scoping Minimum Requirements

The scope for TESC project planning needs to include all phases of construction. Each phase of a construction project needs to be included in the risk analysis and evaluation effort. Intermediate configurations should be accounted for in the TESC scope. Staging activities so that completion of one phase is required before initiation of a second phase may require multiple applications of BMPs. For example, a short duration project may be scheduled and completed during the dry season, but a multi-year project may need soil cover BMPs for each wet season encountered. Inspection and maintenance of BMPs should also be considered, as should the repair or replacement of inadequate or malfunctioning BMPs.

5.1.1 Contingencies

Even with the best planning and risk assessment, there will still be an inherent risk associated with each project. For example, groundwater may be encountered where not expected, soils are often worse than anticipated, construction is sometimes delayed into the wet season. In addition, low probability storm events such as high intensity rainfall in mid-August sometimes cannot be avoided. After completing a thorough risk assessment, scheduling a project to take advantage of optimum conditions, and incorporating a full range of BMPs, materials and funds should be incorporated into the budget to provide for contingency work.

5.2 Budgeting Tools

Budgeting methods for erosion control are not as well developed as for more predictable construction activities. Also, erosion control overlaps with numerous other construction activities. The budgeting tools described below are intended to help when calculating the cost to install and maintain physical BMPs. Possibly the most accurate method for calculating a TESC budget will be consultation with technical personnel and specialists. Consultation with WSDOT personnel with experience on similar projects in the same area is recommended to confirm cost estimates for the selected BMPs.

5.2.1 Cost-Based Estimate

Costs can be calculated from the labor and materials costs for individual items. This method can be accurate but time consuming. Cost-based estimating, however, is the only available method for many of the newer products. The erosion control coordinators office has made available an electronic catalog of all identified erosion control product and service providers in the state. This database may be queried to rapidly determine material costs. Service providers' contact names and numbers are provided to help staff inquire about delivery, mobilization, and labor costs.

5.2.2 Bid-Based Estimate

The State Design office has some very useful tools for making bid based estimates. The Uniform Bid Analysis and Standard Item Table at http://www.wsdot.wa.gov/eesc/CAE/pse/ubastanitem.htm can be used to view per-unit costs for specific standard bid items on past WSDOT projects. This method can rapidly give a price range for most common erosion control bid items. Estimate and Bid Analysis System (EBASE) http://www.wsdot.wa.gov/eesc/CAE/pse/ebase2/index.htm may also be used to view bid histories when preparing estimates.

5.2.3 Construction Contract Information System

The State Construction office maintains the Construction Contract Information System (CCIS) that contains cost information from past projects. This database can be used to estimate future erosion control costs. If a project is going to be built in an area with a history of erosion challenges, one can query the database to view how much was estimated under the line item Water Pollution Prevention /Erosion Control versus how much was actually spent. For instance, on some state routes and on some project types, WSDOT consistently pays more than it estimates for erosion control. If the erosion control costs are consistently greater than the estimates in an area, one should consult with the construction offices that experienced the cost overruns. Ask what factors caused the overruns and incorporate extra measures into the erosion budget/plan to address the problems and prevent or such overruns on the upcoming project. In order to use CCIS, you must contact your local help desk or work-station support person and obtain access.

5.2.4 Staff Support

The collective knowledge about erosion control within WSDOT is tremendous. It is important to tap into the knowledge of our coworkers. Confer with other design and construction offices for their opinions. Construction offices that have experienced severe erosion control problems are usually more than willing to give advice if it can prevent someone from repeating what they experienced.

6 CONTRACTING

6.1 Introduction

The ability to enforce provisions in the TESC plan is directly tied to the contract. Contracts must be written such that they ensure that all of the 13 Minimum Requirements of the plan are addressed throughout construction. The contractual tools for ensuring that the plan is properly enforced include the Standard Specifications for Road Bridge and Municipal Construction, General Special Provisions (statewide and region specific) and Special Provisions).

6.2 Standard Specifications

The Standard Specifications alone usually do not provide adequate contractual means to ensure that contractors meet site-specific requirements for erosion and sediment control. In some cases the Standard Specifications are outdated and do not address changes in environmental regulations and erosion control technology/products. In many instances, erosion control issues are best addressed using other contractual tools because they are too specific to be written as Standard Specifications. Table 6.1 presents a summary of some TESC issues with the corresponding Standard Specifications related to erosion and sedimentation control. As the comments indicate, the standard specifications often do not provide adequate controls for many potential erosion control problems. When the Standard Specifications do not meet a specific erosion control requirement, General Special Provisions or Special Provisions should be added to the contract.

6.3 General Special Provisions and Special Provisions

General Special Provisions (GSPs) or Special Provisions should be prepared whenever the Standard Specifications do not address the specific needs of a project or type of project. Such provisions may involve limiting earthwork in the wet season, timing of pond installation, requiring specific products, etc. In some cases it is not necessary to write your own special provisions. GSPs and Special Provisions have already been written for many common erosion problems and can be pulled from existing libraries. The statewide library for GSPs and Special Provisions is at http://www.wsdot.wa.gov/eesc/CAE/pse/PLANTBCN.HTM. Some regions also have their own libraries of regional GSPs that can be accessed by contacting the regional plans offices. If there is no suitable provision available that can be used, one will have to be written. Peers within design, construction, and environmental offices can often help and should be consulted. The Northwest Region has a runlist of erosion related provisions at:

NW Region \ NW Contract Notices and Status \ Preparing Special Provision Run-lists in Word 2000.

Table 6.1

Standard Specifications Related to Erosion and Sedimentation Control

Issue	Corresponding Specification[a]	Comments
Limiting soil exposure (area and duration)	Exposure: "The engineer will not permit the area of excavation, borrow and embankment work to exceed the contractor's ability to meet the schedule for finish grading mulching, seeding, and other erosion control work". Contractor "s…shall never expose more than 750,000 s.f. (17.2 acres) of erodible earth, unless the engineer approves otherwise" (1.07.15). Clearing: "Complete the clearing work **at least** 1 mile ahead of clearing" 2-01.31(1) Grubbing: "Complete the grubbing work **at least** 1,000 feet ahead of grading" 2-01.31(2)	Duration of exposure is not addressed and time of year is not considered. Exposing too much soil for too long is the leading cause of erosion damage and violations. Provisions to limit soil exposure, especially in the wet season, may be required. Limits on the area and duration of soil exposure is sometimes addressed in TESC plan but often not followed if not in the contract.
Timing of sediment control BMP installation	Schedule required as part of TESC plan 1.07.15	Timing of construction is not directly addressed in the Standard Specifications. One of the most common contributing factors to violations is not having the detention pond in as a first step in grading. According to the HRM the "Sediment ponds…filter fences *etc*…shall be constructed as a first step in grading" (Pg. 5-3). A special provision stating when detention BMPs are to be installed ensures that they are in when most needed.
Keep roadways clean (see stab. Const entrance)	The Contractor shall…maintain existing roads and streets within the project limits (and adjacent streets-mentioned later) keeping them open, and in good clean, safe condition at all times. 1-07.23(1)	This was written to keeps roads safe for the public. Roads must be clean enough to make sure that runoff meets State water quality standards. Additional sweeping may be required for road surfaces that are not open to the traveling public.
Silt Fences	2-12.3.(5) Described in great detail. 9-33.2 Table 6 Geotextile for temporary silt fence	Local requirements (i.e., King County) may vary in fence post spacing, height, post depth in soil, etc.
Ditch lining	2-12.3(4) Describes geotextile installation methods and how to secure it with riprap. 9-33.2 Tables 4 and 5 Geotextile Specifications for permanent erosion control and ditch lining	Many organic and inorganic erosion control blankets are also effective. Many new products do not meet specification as written but are better than products that meet specifications. Special provisions will be needed if those are selected.
Use of wood chips	2-01.2 "The contractor should sell timber, wood, <u>chips</u> or firewood….disposal options are burning, hauling to a waste site or selling. "The contractor shall spread <u>unsold</u> chips on site…"	The Highway Runoff Manual correctly states that "wood ships are a very inexpensive BMP when used from trees cleared on site". Some project offices have used them very effectively. If wood chips can be used as mulch on site, a provision should be written stating that they be kept on site and used as directed by the Engineer.
Slides during construction	2-03.3(11) Basically states that if a slide occurs on a finished slope before final approval WSDOT will pay force account to have it fixed.	This specification keeps the liability for slope repairs on WSDOT if a contractor delays in finishing slopes. A provision requiring that the contractor pay for the repairs if they neglect to cover the slope in a timely manner may be helpful.
Grading-Hillside terraces	2-03.3(14) "Unless directed otherwise by the engineer, the contractor shall terrace embankments…"	This may help prevent slip planes on fills.
Compaction	03.3(14) Compaction requirements quite detailed for structural purposes. 2-01.3(b)Compaction requirements for seed bed preparation also included. 8-	Track walking perpendicular to the slope can reduce erosion by up to 50 percent and ran reduce runoff volumes by up to 20 percent. Provisions encouraging immediate track walking once soils are at grade can significantly reduce erosion
Dewatering	Nothing as far as water quality is concerned	Dewatering is a major problem for us. Offsite water, seeps, high groundwater levels can all lead to huge erosion control cost overruns and violations. The Highway Runoff Manual States - "Dewatering devices shall discharge into a sediment trap or sediment pond. (Puget Sound condition)" Page 5-4. If dewatering is anticipated, a provision will be required directing the contractor to dispose of the water in a way that meets water quality laws.
Application of asphalt emulsion for erosion control	8-01.3(6) Application instructions Material Specification 9-14.4(7)	Essentially entails spraying asphalt on slopes. This technique has not been used for years and would. It is unlikely that his method will ever be used again.

Table 6.1

Standard Specifications Related to Erosion and Sedimentation Control, Continued

Issue	Corresponding Specification[a]	Comments
Placing Jute, Erosion control blanket,	8-01.3(8) Installation detailed 9-14.5(1) Jute Material Spec. 9-14.5(2) Erosion Control Blanked material Spec.	Specifications are outdated (19 of 133 available products now available meet specifications). Many new and better products do not fit the specs. Special provisions should be used for newer products until the Standard Specifications are updated.
None of the below Best Management Practices are described in Standard Specifications. All may require Special Provisions until the standard Specifications are revised.		
Stabilized construction entrance and tire wash		
Construction road stabilization		
Level Spreader		
Interceptor Dike and Swale		
Pipe Slope Drains		
Check dams		
Straw bale barrier		
Brush barrier		
Gravel filter berm		
Storm drain inlet protection		
Sediment trap		
PAM as a soil stabilizer		
[a] 2000 version of Standard Specifications for Roads Bridge and Municipal Construction.		

APPENDIX A

GLOSSARY AND ACRONYMS

Glossary

Adjacent Steep Slope — A slope with a gradient of 15 percent or steeper within 500 feet of the site.

Basin Plan — A plan and all implementing regulations and procedures including but not limited to land use management adopted by ordinance for managing surface and storm water quality and quantity management facilities and features within individual subbasins.

Best Management Practice (BMP) — Physical, structural, and/or managerial practices that, when used singly or in combination, reduce the downstream quality and quantity impacts of stormwater.

Biofiltration — The simultaneous process of filtration, infiltration, adsorption, and biological uptake of pollutants in stormwater that takes place when runoff flows over and through vegetated areas.

Biofiltration Swale — A sloped, vegetated channel or ditch that provides both conveyance and water quality treatment to stormwater runoff. It does not provide stormwater quantity control but can convey runoff to BMPs designed for that purpose.

Buffer — The zone contiguous with a sensitive area that is required for the continued maintenance, function, and structural stability of the sensitive area. The critical functions of a riparian buffer (those associated with an aquatic system) include shading, input of organic debris and coarse sediments, uptake of nutrients, stabilization of banks, interception of fine sediments, overflow during high water events, protection from disturbance by humans and domestic animals, maintenance of wildlife habitat, and room for variation of aquatic system boundaries over time due to hydrologic or climatic effects. The critical functions of terrestrial buffers include protection of slope stability, attenuation of surface water flows from storm water runoff and precipitation, and erosion control.

CN — Soil Conservation Service's Curve Number. This number describes the runoff characteristics of a particular type of soil.

Catchbasin — A chamber or well, usually built at the curb line of a street, for the admission of surface water to a sewer or subdrain, having at its base a sediment sump designed to retain grit and detritus below the point of overflow.

Catchment — Surface drainage area.

Channel — A feature that conveys surface water and is open to the air.

Channelization — Alteration of a stream channel by widening, deepening, straightening, cleaning, or paving certain areas to change flow characteristics.

Check Dam — Small dam constructed in a gully or other small watercourse to decrease the streamflow velocity, minimize channel scour, and promote deposition of sediment.

Clay Lens — A naturally occurring, localized area of clay, which acts as an impermeable layer to runoff infiltration.

Closed Depression — An area which is low-lying and either has no, or such a limited, surface water outlet that during storm events the area acts as a retention basin.

Cohesion — The capacity of a soil to resist shearing stress, exclusive of functional resistance.

Conventional Pollutants — Contaminants (other than nutrients) such as sediment, oil, and vehicle fluids.

Conveyance — A mechanism for transporting water from one point to another, including pipes, ditches, and channels.

Conveyance System — The drainage facilities, both natural and man-made, which collect, contain, and provide for the flow of surface and stormwater from the highest points on the land down to a receiving water. The natural elements of the conveyance system include swales and small drainage courses, streams, rivers, lakes, and wetlands. The human-made elements of the conveyance system include gutters, ditches, pipes, channels, and most retention/detention facilities.

Depression Storage — The amount of precipitation that is trapped in depressions on the surface of the ground.

Design Storm — A prescribed hyetograph and total precipitation amount (for a specific duration recurrence frequency) used to estimate runoff for a hypothetical storm of interest or concern for the purposes of analyzing existing drainage, designing new drainage facilities or assessing other impacts of a proposed project on the flow of surface water.

Detention — The storage and subsequent release of excess stormwater runoff from a site.

Detention Facility — An above or below ground facility, such as a pond or tank, that temporarily stores stormwater runoff and subsequently releases it at a slower rate than it is collected by the drainage facility system. There is little or no infiltration of stored stormwater.

Detention Time — The theoretical time required to displace the contents of a stormwater treatment facility at a given rate of discharge (volume divided by rate of discharge).

Discharge — Outflow; the flow of a stream, canal, or aquifer. One may also speak of the discharge of a canal or stream into a lake, river, or ocean. (Hydraulics) Rate of flow, specifically fluid flow; a volume of fluid passing a point per unit of time, commonly expressed as cubic feet per second, cubic meters per second, gallons per minute, gallons per day, or millions of gallons per day.

Drainage — Refers to the collection, conveyance, containment, and/or discharge of surface and storm water runoff.

Drainage Basin — A geographic and hydrologic sub-unit of a watershed.

Drainage Channel — A drainage pathway with a well-defined bed and banks indicating frequent conveyance of surface and stormwater runoff.

Drainage Course — A pathway for watershed drainage characterized by wet soil vegetation; often intermittent in flow.

Drainage Divide — The boundary between one drainage basin and another.

Drain — A buried pipe or other conduit (closed drain). A ditch (open drain) for carrying off surplus surface water or ground water.

Drainage, Soil — The removal of water from a soil.

Dry Pond — A facility that provides stormwater quantity control by containing excess runoff in a detention basin, then releasing the runoff at allowable levels.

Dry Vault/Tank — A facility that treats stormwater for water quantity control by detaining runoff in underground storage units and then releases reduced flows at established standards.

Emergency Spillway — A channel used to safely convey flood discharges in excess of the capacity of the principal outlet.

Energy Dissipater — Any means by which the total energy of flowing water is reduced. In stormwater design, they are usually mechanisms that reduce velocity prior to, or at, discharge from an outfall in order to prevent erosion. They include rock splash pads, drop manholes, concrete stilling basins or baffles, and check dams.

Erosion — The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. Also, detachment and movement of soil or rock fragments by water, wind, ice, or gravity. The following terms are used to describe different types of water erosion.

Erosion and Sediment Control — Any temporary or permanent measures taken to reduce erosion, control siltation and sedimentation, and ensure that sediment-laden water does not leave a site.

Erosion and Sediment Control Facility — A type of drainage facility designed to hold water for a period of time to allow sediment contained in the surface and stormwater runoff directed to the facility to settle out so as to improve the quality of the runoff.

Existing Site Conditions — The conditions (ground cover, slope, drainage patterns) of a site as they existed on the first day that the project entered the design phase. Projects which drain into a sensitive area designated by a federal, state, or local agency may be required to use undisturbed forest conditions for the purposes of calculating runoff characteristics instead of using existing site conditions.

Experimental Best Management Practice (BMP) — A BMP that has not been tested and evaluated by the Department of Ecology in collaboration with local governments and technical experts.

Forebay — An easily maintained, extra storage area provided near an inlet of a BMP to trap incoming sediments before they accumulate in a pond or wetland BMP.

Freeboard — The vertical distance between the design water surface elevation and the elevation of the barrier which contains the water.

Frost-Heave — The upward movement of soil surface due to the expansion of water stored between particles in the first few feet of the soil profile as it freezes. May cause surface fracturing of asphalt or concrete.

Frequency of Storm (Design Storm Frequency) — The anticipated period in years that will elapse, based on average probability of storms in the design region, before a storm of a given intensity and/or total volume will recur; thus a 10-year storm can be expected to occur on the average once every 10 years. Sewers designed to handle flows which occur under such storm conditions would be expected to be surcharged by any storms of greater amount or intensity.

Gabion — A rectangular or cylindrical wire mesh cage filled with rock and used as a protecting agent, revetment, etc., against erosion. Soft gabions, often used in stream bank stabilization, are made of geotextiles filled with dirt, in between which cuttings are placed.

Gage — Device for registering precipitation, water level, discharge, velocity, pressure, temperature, etc.

Ground Water Table — The free surface of the ground water, that surface subject to atmospheric pressure under the ground, generally rising and falling with the season, the rate of withdrawal, the rate of restoration, and other conditions. It is seldom static.

Gully — A channel caused by the concentrated flow of surface and stormwater runoff over unprotected erodible land.

Hydrograph — A graph of runoff rate, inflow rate or discharge rate, past a specific point over time.

Hydrologic Soil Groups — A soil characteristic classification system defined by the U.S. Soil Conservation Service in which a soil may be categorized into one of four soil groups (A, B, C, or D) based upon infiltration rate and other properties.

Hydrology — The science of the behavior of water in the atmosphere, on the surface of the earth, and underground.

Hydroperiod — A seasonal occurrence of flooding and/or soil saturation; it encompasses depth, frequency, duration, and seasonal pattern of inundation.

Hyetograph — A graph of precipitation versus time.

Impervious Surface — A hard surface area, which either prevents or retards the entry of water into the soil. Common impervious surfaces include roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled surfaces.

Infiltration — The downward movement of water from the surface to the subsoil.

Infiltration Facility (or system) — A drainage facility designed to use the hydrologic process of surface and stormwater runoff soaking into the ground, commonly referred to as a percolation, to dispose of surface and stormwater runoff.

Infiltration Pond — A facility that provides stormwater quantity control by containing excess runoff in a detention facility, then percolating that runoff into the surrounding soil.

Inlet — A form of connection between surface of the ground and a drain or sewer for the admission of surface and stormwater runoff.

Invert Elevation — The vertical elevation of a pipe or orifice in a pond, which defines the water level.

Isopluvial Map — A map with lines representing constant depth of total precipitation for a given return frequency.

Lag Time — The interval between the center of mass of the storm precipitation and the peak flow of the resultant runoff.

Land Disturbing Activity — Any activity that results in a change in the existing soil cover (both vegetative and nonvegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to demolition, construction, clearing, grading, filling and excavation.

Level Spreader — A temporary BMP used to spread stormwater runoff uniformly over the ground surface as sheet flow. The purpose of level spreaders are to prevent concentrated, erosive flows from occurring. Level spreaders will commonly be used at the upstream end of wider biofilters to ensure sheet flow into the biofilter.

Low Flow Channel — An incised or paved channel from inlet to outlet in a dry basin, which is designed to carry low runoff flows and/or baseflow, directly to the outlet without detention.

Mass Wasting — The movement of large volumes of earth material downslope.

Mean Depth — Average depth; cross-sectional area of a stream or channel divided by its surface or top width.

Mean Velocity — The average velocity of a stream flowing in a channel or conduit at a given cross-section or in a given reach. It is equal to the discharge divided by the cross-sectional area of the reach.

Mitigation — means, in the following order of preference:

1. Avoiding the impact altogether by not taking a certain action or part of an action;
2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;
3. Rectifying the impact by repairing, rehabilitating or restoring the affected environment;
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
5. Compensation for the impact by replacing, enhancing, or providing substitute resources or environments.

Monitor — To systematically and repeatedly measure something in order to track changes.

Monitoring — The collection of data by various methods for the purposes of understanding natural systems and features, evaluating the impacts of development proposals on such systems, and assessing the performance of mitigation measures imposed as conditions of development.

National Pollutant Discharge Elimination System (NPDES) — The part of the federal Clean Water Act, which requires point source discharges to obtain permits. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington State Department of Ecology.

Native Growth Protection Easement (NGPE) — An easement granted for the protection of native vegetation within a sensitive area or its associated buffer. The NGPE shall be recorded on the appropriate documents of title and filed with the County Records Division.

Natural Location — The location of those channels, swales, and other nonmanmade conveyance systems as defined by the first documented topographic contours existing for the subject property, either from maps or photographs, or such other means as appropriate.

New Development — Includes the following activities: land disturbing activities, structural development, including construction, installation or expansion of a building or other structure; creation of impervious surfaces; Class IV — general forest practices that are conversions from timber land to other uses; and subdivision and short subdivision of land as defined in RCW 58.17.020. All other forest practices and commercial agriculture are not considered new development.

New Impervious Area — The impervious area that is being created by the project.

Nonpoint Source Pollution — Pollution that enters a water body from diffuse origins on the watershed and does not result from discernible, confined, or discrete conveyances.

Normal Depth — The depth of uniform flow. This is a unique depth of flow for any combination of channel characteristics and flow conditions. Normal depth is calculated using Manning's Equation.

NRCS — Natural Resource Conservation Service, U.S. Department of Agriculture.

Off-site — Any area lying upstream of the site that drains onto the site and any area lying downstream of the site to which the site drains.

Outlet — Point of water disposal from a stream, river, lake, tidewater, or artificial drain.

Outlet Channel — A waterway constructed or altered primarily to carry water from man-made structures, such as terraces, tile lines, and diversions.

Peak Discharge — The maximum instantaneous rate of flow during a storm, usually in reference to a specific design storm event.

Permeability Rate — The rate at which water will move through a saturated soil.

Permeable Soils — Soil materials with a sufficiently rapid infiltration rate so as to greatly reduce or eliminate surface and stormwater runoff. These soils are generally classified as SCS hydrologic soil types A and B.

Perviousness — Related to the size and continuity of void spaces in soils; related to a soil's infiltration rate.

Practicable — Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pretreatment — The removal of material such as gross solids, grit, grease, and scum from flows prior to physical, biological, or physical treatment processes to improve treatability. Pretreatment may include screening, grit removal, stormwater, and oil separators.

Rational Method — A means of computing storm drainage flow rates (Q) by use of the formula Q = CIA, where C is a coefficient describing the physical drainage area, I is the rainfall intensity and A is the area.

Receiving Waters — Bodies of water or surface water systems receiving water from upstream manmade (or natural) streams.

Recharge — The flow to ground water from the infiltration of surface and stormwater runoff.

Regional — An action (here, for stormwater management purposes) that involves more than one discrete property.

Regional Detention Facility — A stormwater quantity control structure designed to correct existing excess surface water runoff problems of a basin or subbasin. The area downstream has been previously identified as having existing or predicted significant and regional flooding and/or erosion problems.

This term is also used when a detention facility is used to detain stormwater runoff from a number of different businesses, developments or areas within a catchment. The use of regional detention facilities may be more efficient than on-site stormwater treatment although the preferred option is to include some on-site stormwater treatment through the use of grassy swales, etc., even when regional detention facilities are used.

Release Rate — The computed peak rate of surface and stormwater runoff for a particular design storm event and drainage area conditions.

Restoration — Actions performed to reestablish wetland functional characteristics and processes that have been lost by alterations, activities, or catastrophic events in an area that no longer meets the definition of a wetland.

Retention — The process of collecting and holding surface and stormwater runoff with no surface outflow.

Retention/Detention Facility (R/D) — A type of drainage facility designed either to hold water for a considerable length of time and then release it by evaporation, plant transpiration, and/or infiltration into the ground; or to hold surface and stormwater runoff for a short period of time and then release it to the surface and stormwater management system.

Retrofitting — The renovation of an existing structure or facility to meet changed conditions or to improve performance.

Return Interval — A statistical term for the average time of expected interval that an event of some kind will equal or exceed given conditions (e.g., a stormwater flow that occurs every 2 years).

Rill — A small intermittent watercourse with steep sides, usually only a few inches deep. Often rills are caused by an increase in surface water flow when soil is cleared of vegetation.

Riprap — A facing layer or protective mound of stones placed to prevent erosion or sloughing of a structure or embankment due to flow of surface and stormwater runoff.

Riparian — Pertaining to the banks of streams, wetlands, lakes or tidewater.

Riser — A vertical pipe extending from the bottom of a pond BMP that is used to control the discharge rate from a BMP for a specified design storm.

Runoff — Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes and wetlands as well as shallow ground water.

Sediment — Fragmented material that originates from weathering and erosion of rocks or unconsolidated deposits, and is transported by, suspended in, or deposited by water.

Sedimentation — The depositing or formation of sediment.

Settleable Solids — Those suspended solids in stormwater that separate by settling when the stormwater is held in a quiescent condition for a specified time.

Sheetflow — Runoff which flows over the ground surface as a thin, even layer, not concentrated in a channel.

Short Circuiting — The passage of runoff through a BMP in less than the design treatment time.

Siltation — The process by which a river, lake, or other water body becomes clogged with sediment. Silt can clog gravel beds and prevent successful salmon spawning.

Soil Group — A classification of soils by the Soil Conservation Service into four runoff potential groups. The groups range from A soils, which are very permeable and produce little or no runoff, to D soils, which are not very permeable and produce much more runoff.

Soil Permeability — The ease with which gases, liquids, or plant roots penetrate or pass through a layer of soil.

Soil Stabilization — The use of measures such as rock lining, vegetation or other engineering structures to prevent the movement of soil when loads are applied to the soil.

Source Control BMP — A BMP that is intended to prevent pollutants from entering stormwater. A few examples of source control BMPs are erosion control practices, maintenance of stormwater facilities, constructing roofs over storage and working areas, and directing wash water and similar discharges to the sanitary sewer or a dead end sump.

Spillway — A passage such as a paved apron or channel for surplus water over or around a dam or similar obstruction. An open or closed channel, or both, used to convey excess water from a reservoir. It may contain gates, either manually or automatically controlled, to regulate the discharge of excess water.

Storm Frequency — The time interval between major storms of predetermined intensity and volumes of runoff for which storm sewers and other structures are designed and constructed to handle hydraulically without surcharging and backflooding, e.g., a 2-year, 10-year or 100-year storm.

Stormwater — That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels or pipes into a defined surface water channel, or a constructed infiltration facility.

Stormwater Drainage System — Constructed and natural features, which function together as a system to collect, convey, channel, hold, inhibit, retain, detain, infiltrate, divert, treat or filter stormwater.

Stormwater Facility — A constructed component of a stormwater drainage system, designed or constructed to perform a particular function, or multiple functions. Stormwater facilities include, but are not limited to, pipes, swales, ditches, culverts, street gutters, detention basins, retention basins, constructed wetlands, infiltration devices, catchbasins, oil/water separators, sediment basins and modular pavement.

Stormwater Quality — A term used to describe the chemical, physical, and biological characteristics of stormwater.

Stormwater Quantity — A term used to describe the volume characteristics of stormwater.

Stormwater Site Plan — A plan which shows the measures that will be taken during and after project construction to provide erosion and sediment control and stormwater control.

Streams — Those areas where surface waters flow sufficiently to produce a defined channel or bed. A defined channel or bed is indicated by hydraulically sorted sediments or the removal of vegetative litter or loosely rooted vegetation by the action of moving water. The channel or bed need not contain water year-round.

Subbasin — A drainage area which drains to a water course or waterbody named and noted on common maps and which is contained within a basin.

Subgrade — A layer of stone or soil used as the underlying base for a BMP.

Suspended Solids — Organic or inorganic particles that are suspended in and carried by the water. The term includes sand, mud, and clay particles (and associated pollutants) as well as solids in stormwater.

Swale — A shallow drainage conveyance with relatively gentle side slopes, generally with flow depths less than one foot.

TESC — Temporary Erosion and Sediment Control (Plan).

Time of Concentration — The time period necessary for surface runoff to reach the outlet of a subbasin from the hydraulically most remote point in the tributary drainage area.

Toe of Slope — A point or line of slope in an excavation or cut where the lower surface changes to horizontal or meets the existing ground slope; or a point or line on the upper surface of a slope where it changes to horizontal or meets the original surface.

Topography — General term to include characteristics of the ground surface such as plains, hills, mountains; degree of relief, steepness of slopes, and other physiographic features.

Total Solids — The solids in water, sewage, or other liquids, including the dissolved, filterable, and nonfilterable solids. The residue left when the moisture is evaporated and the remainder is dried at a specified temperature, usually 130°C.

Total Suspended Solids — The entire amount of organic and inorganic particles dispersed in water.

Travel Time — The estimated time for surface water to flow between two points of interest.

Underdrain — Plastic pipes with holes drilled through the top, installed on the bottom of an infiltration BMP which are used to collect and remove excess runoff.

Unstable Slopes — Those sloping areas of land which have in the past exhibited, are currently exhibiting, or will likely in the future exhibit, mass movement of earth.

Vactor Waste — The waste material that is found in the bottom of a catch basin.

Vegetative Filter Strip — A facility that is designed to provide stormwater quality treatment of conventional pollutants but not nutrients through the process of biofiltration.

Water Quality BMP — A BMP specifically designed for pollutant removal.

Water Quality Design Storm — The 6-month recurrence interval 24-hour duration storm event.

Water Quality Standards — Minimum requirements of purity of water for various uses; for example, water for agricultural use in irrigation systems should not exceed specific levels of sodium bicarbonate, pH, total dissolved salts, etc. In Washington, the Department of Ecology sets water quality standards.

Water Quantity BMP — A BMP specifically designed to reduce the peak rate of stormwater runoff.

Wetlands — Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. This includes wetlands created, restored or enhanced as part of a mitigation procedure. This does not include constructed wetlands or the following surface waters of the state intentionally constructed from sites that are not wetlands: irrigation and drainage ditches, grass-lined swales, canals, agricultural detention facilities, farm ponds, and landscape amenities.

Wet Pond — A facility that treats stormwater for water quality by utilizing a permanent pool of water to remove conventional pollutants from runoff through sedimentation, biological uptake, and plant filtration.

Wet Vaults/Tanks — Underground storage facilities that treat stormwater for water quality through the use of a permanent pool of water that acts as a settling basin.

ACRONYMS

AOS	=	Apparent Opening Size
BMP	=	Best Management Practice
Ecology	=	Department of Ecology
EPA	=	Environmental Protection Agency
HPA	=	Hydraulic Project Approval
NPDES	=	National Pollutant Discharge and Elimination System
NRCS	=	Natural Resource Conservation Service
SA	=	Surface Area
SD	=	Settling Depth
SPCC	=	Spill Prevention Control and Countermeasures
SSP	=	Stormwater Site Plan
SWPPP	=	Stormwater Pollution Prevention Plan
TESC	=	Temporary Erosion and Sediment Control
TSS	=	Total Suspended Solids
WAC	=	Washington Administrative Code
WSDOT	=	Washington State Department of Transportation